The FOUNDRY

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Contents

VOLUME 67

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	PAGE
Editorial	21
Casts Diesel Engines for Trucks *By Pat Dwyer*	22
Gray Iron Metallurgical Practice *By C. H. Lorig*	26
"Specs" *By John Howe Hall*	28
Nonferrous Foundry Has Wide Range of Alloys Available *By N. K. B. Patch*	30
Among Detroit Foundries *By A. H. Allen*	31
Foundry Industry Continues March of Progress	32
Questions and Answers	34
Men of Industry	38
Convention Program Will Cover Wide Range of Topics	42
Wisconsin Chapter Stages Regional Meeting	44
The Adventures of Bill *By Pat Dwyer*	50
Viewing Foundry Developments at Short Range	54
Activities of Foundry Groups	57
Malleable Society Has a New Activity	91
Readers Comment	96
European Foundry Practice	99
Obituary	100
Foundry Equipment and Supplies	102
Foundry Activities	108
New Trade Publications	110

30 tons of core

LINOIL

"Relative to the data on the largest semi-steel casting made in our plant and incidentally in the Chicago area, we submit the following information:

"Approximately thirty tons of core sand were used in the making of this casting. All cores were strictly oil sand cores and were baked thoroughly in one night's baking.

"We are especially pleased with Linoil because of the excellent manner in which the cores cleaned out from the casting."

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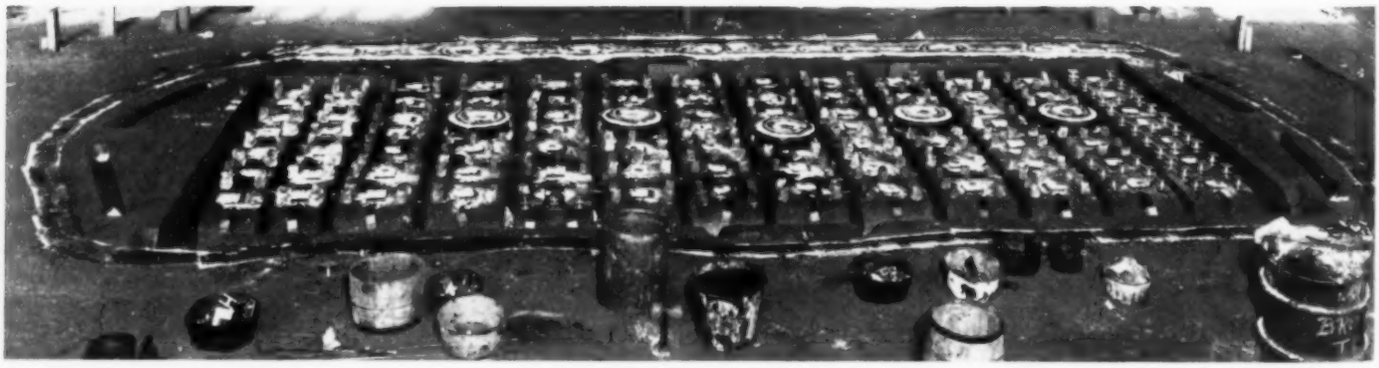

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Editorial

Federal Committee To Promote Apprentice Programs

AS INDUSTRY starts to rebuild its personnel structure following each dip in the economic cycle, the need for an adequate supply of trained men becomes apparent. Today any shortage of men has not been sufficient to press the foundry industry into action. Good men with excellent training and adequate practical experience appear available for all of the jobs which are being opened for a number of reasons.

Tomorrow the situation may be of an entirely different character. A continuation of the upturn in foundry production, witnessed during the last six months of 1938 and again seemingly acquiring momentum in February of 1939, soon may exhaust the supply of trained executives of all classes as well as skilled molders and all around foundry mechanics. Therefore, it does not seem presumptuous again to call attention to the ever present need for sound consideration of a more aggressive apprentice training program for the foundry industry.

Many individual companies and numerous manufacturing centers, where the production of castings constitutes an important factor in the industrial and economic well being of the community, are doing an excellent piece of work in apprentice training. Activity in that direction simply needs expanding as good insurance against possible future demands which seem practically certain of fulfillment.

Frequently in the past apprentice training was not established on the broad basis so essential to the acquisition of complete knowledge of the fundamentals of foundry practice by the apprentice and the return of maximum benefits to the employer. Programs were not well defined, competent instruction frequently was not provided, related supplemental instruction at times was sketchy, and the practice of holding the apprentice too long on one job, particularly at peak production loads, at times was followed. Work of various associations and societies, correspondence schools and other interested groups has gone a long way in correcting such defects in the training programs.

Within the last year or so another aid to industrial training programs is beginning to be felt. Federal legislation has placed the promotion of apprenticeship under the direction of the department of labor. A unit within the division of labor standards, with William F. Patterson as chief, has been formed and a committee on apprenticeship now is functioning. The object of the program is "To focus attention on indentured apprenticeship, to the end that youths employed in the skilled trades and those entering such trades shall receive the benefits of broad training on the job, supplemented by education in subjects related to the trade."

Both the committee and the administrator of the Fair Labor Standards act accept the following definition of apprentice:

"The term apprentice shall mean a person at least 16 years of age who is covered by a written agreement with an employer, or with an association of employers or employes acting as agent for an employer, and approved by the State apprentice council or other established authority, which apprentice agreement provides for not less than 4000 hours of reasonably continuous employment for such person, and for his participation in an approved schedule of work experience through employment and for at least 144 hours per year of related supplemental instruction."

Longer Averaging Period

IN RESPONSE to a recent question from a foundry, the general counsel's office of the wage and hour division, department of labor, ruled against the admissibility of "average hours" in the Fair Labor Standards act. The foundry question was as follows:

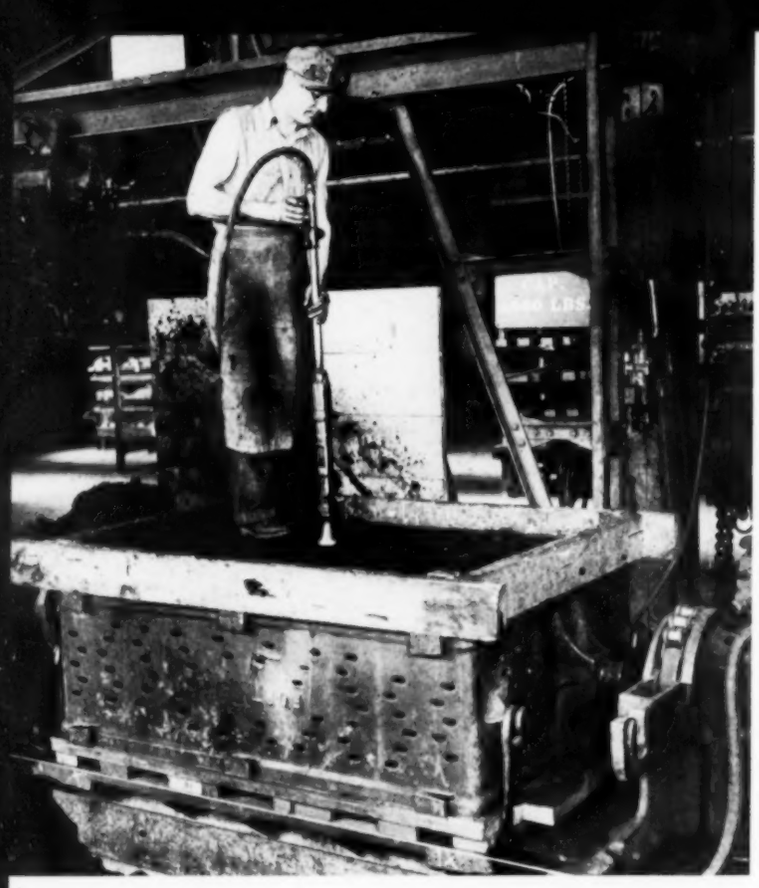
Due to the fact that in our trade it is impossible for us to make a duplication of our experienced labor and also due to the fact that we are unable to make use of the 4 hours over 40 hours, we are asking your permission, if it can be had, to operate one week at 40 hours and every other week at 48 hours, making an average of 44 hours a week.

The ruling was as follows:

The Fair Labor Standards act takes as its standard a single week and requires compensation at the overtime rate to be paid for all hours in excess of 44 hours worked during any workweek. It does not permit averaging of hours over 2 or more weeks. The act gives the administrator no power whatever to exempt persons subject to it from any of its provisions.

We agree with a recent statement of John C. Gall, counsel of the National Association of Manufacturers, that consideration should be given to the averaging of work hours over longer periods

Frank G. Steinebach
Editor



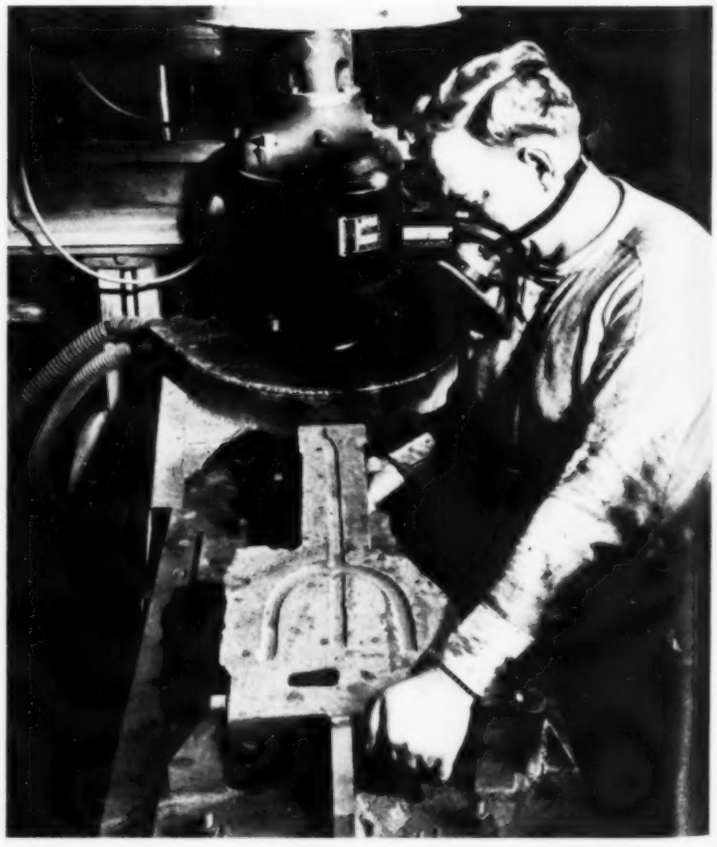
stupendous advances applied science has made in the past 50 years experience no feeling of fright, no goose pimples, tightening of the stomach muscles or stoppage of the heart when the great black horse and headless rider range up alongside the terror stricken schoolmaster. They anticipate the denouement. From a secure position behind the scenes of superior knowledge they are quite confident that the entire story—in their own choice and simple language—is well and skilfully cut, but it is still the old baloney. Hi-ho Silver!

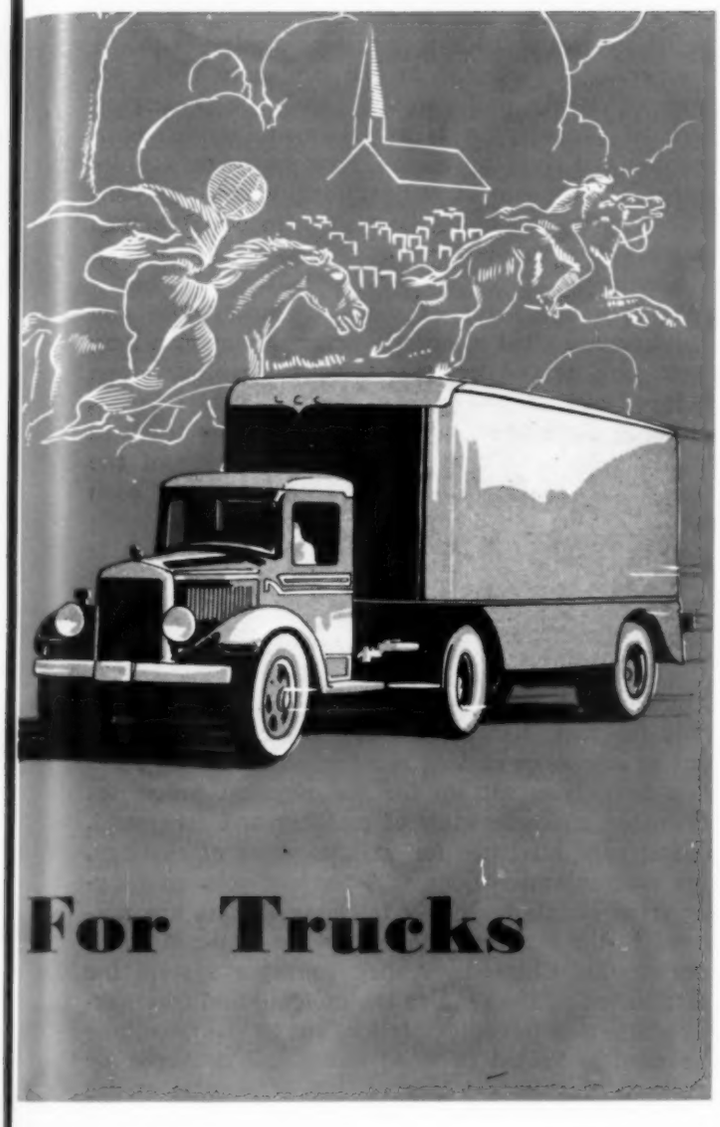
Modern readers of all ages from cocky youth to senile old age readily could appreciate Ikabod's sweat dripping fright and anguish if the author of the story had peered ahead into the future and instead of a horseman had confronted the schoolmaster with a great modern truck roaring down the highway like a monstrous bat from the nether regions or the well known mill tail of the same frequently quoted locality. Glaring headlights, grinding wheels and motor exhaust combined, either would have laid Ike out cold and stiff, or have reduced him to a state of gibbering imbecility long before the red and green

Casts Diesel Engines

ELDERLY READERS slightly afflicted with subconscious superstition smile tolerantly when any person mentions the *Legend of Sleepy Hollow*. Years ago when they first read the story they were quite properly thrilled. They shared Ichabod Crane's mortal terror as he raced half a length in advance of the Galloping Hessian, a headless figure on a great black horse which threatened every moment to grind him into the dust under thundering steel shod hoofs. Not until the last page was reached and a hint was dropped that a rival suitor for the favors of the charming Katrina Van Tassell, had a shrewd and impish hand in the deal, did the readers draw a sigh of relief. A mystery explained is no longer a mystery and they wondered why Ikabod, Ickabod, Itchabod or whatever way Schoolmaster Crane pronounced his silly name, they wondered why he did not see through the hoax and confound Van Brunt the counterfeit Hessian by demanding haughtily what he meant, pray, by such clownish antics.

Younger readers familiar all their lives with the





port and starboard lights, and the evil eye red tail light had disappeared around the bend in Sleepy Hollow.

Unfortunately, while Mr. Irving could and did peer knowingly into the past to the extent of creating a convincing picture of conditions prevailing in the old Dutch settlement above New York, about the turn of the eighteenth century, he could not—or at least so far as we know—he did not take a running peek into the future. He did not see the United States covered with a net work of roads from coast to coast and from the Great Lakes to the Gulf of Mexico. Over these roads the great trucks rumble by day and night, in summer weather when the heat waves shimmer above the pavement and in winter when the same pavements are covered with snow and ice. The trucks are loaded with every possible commodity from breakfast food to steel sheets and from pink pills to dynamite.

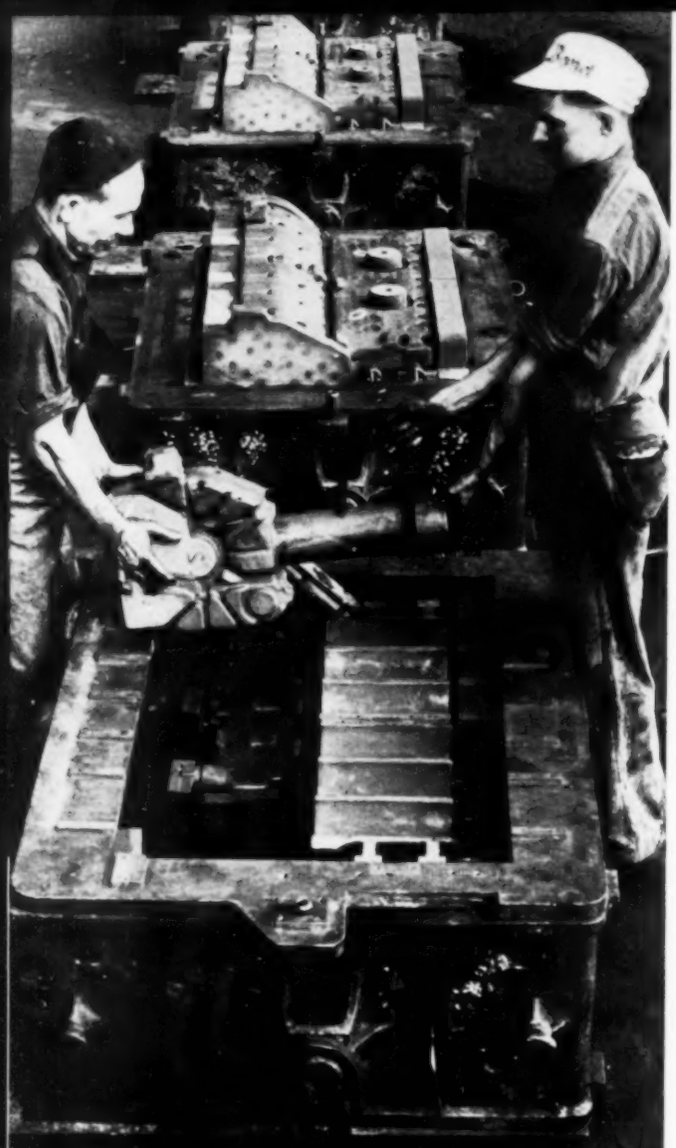
At the last roundup for statistical purpose the total number of trucks paying a handsome registration fee in this country is given as 4,250,000. Presumably this includes everything able to run on four wheels and ranging from the old decrepid coughing bundle of junk held together with strands of hay wire, to the shiny, streamlined giants that eat up the miles with the speed, precision and accuracy of the highest class passenger vehicles. Properly impressed by these figures the average reader naturally will inquire: Where did all these trucks come from? Obviously the stork legend offers little encouragement to the earnest seeker after information in this particular field.

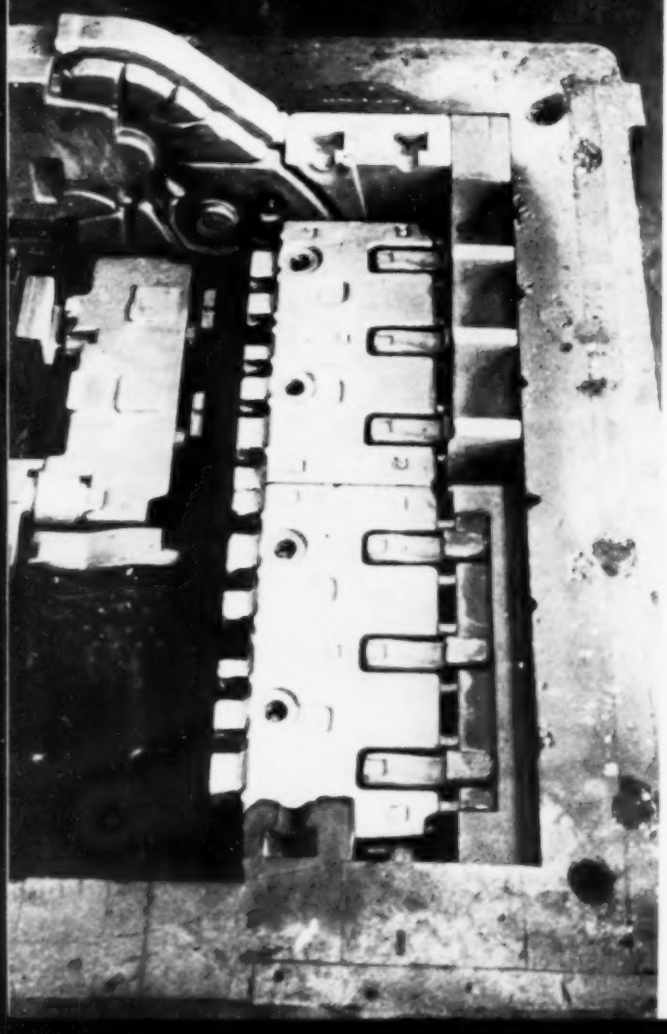
Build Heavy Duty Truck Engine

Pinned down to a specific statement on figures we do not know where all the trucks came from. If we were asked where they all will wind up eventually, we might hazard a guess. However, for the present purpose it is sufficient to say that a large number are made by the Mack Trucks Inc., with head office in New York, and with plants in Plainfield and New Brunswick, N. J., and Allentown, Pa. In existence since 1907 the company instituted a campaign of intense development over the past 8 years which culminated in the production of a diesel type engine known as the Mack-Lanova for heavy duty trucks and busses. The engine is four-cycle, four stroke and operates on diesel fuel or No. 2 furnace oil. In operation one stroke for positive intake of fresh air, one stroke for full compression of fuel, one stroke for full expansion power impulse, and one stroke for full cleaning of cylinder. All engine castings, iron, aluminum, brass and bronze and special compositions are made in the foundry which the company operates at the New Brunswick plant.

The foundry building, large, roomy, modernly equipped and operated under close technical control houses the activities of four ordinarily distinct departments. Thus iron castings are made in one sec-

Fig. 1 (Above, left)—Required density of sand on top of the mold is secured by going over it with a pneumatic rammer. Fig. 2 (Left, below)—Half cores are placed in a jig and surfaced under a grinding head. Fig. 3 (Below)—Cylinder molds are skin dried





tion, aluminum castings in another, bronze brass and special alloy combinations in a third section, with the coremaking department in the center to serve all three efficiently and rapidly. Built on a sloping piece of property, a large basement serves as a cleaning and shipping room. Raw materials are delivered at one side of the building where the yard is flush with the foundry floor. Castings are shipped by truck from a platform at the lower level served by a conveyor.

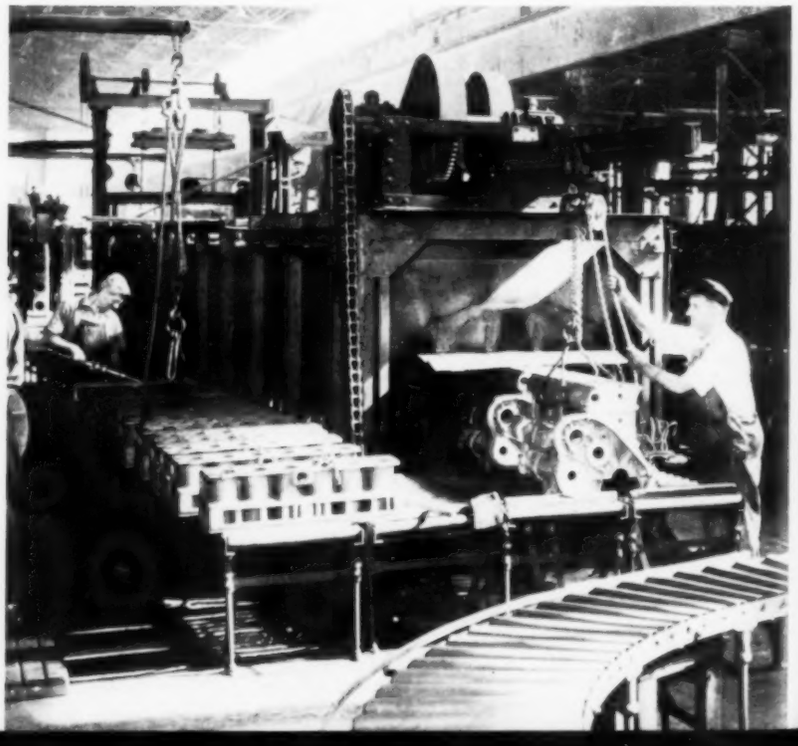
Pig iron and scrap of various grades, coke and limestone are piled in orderly arrangement in a long stock yard served by an overhead traveling crane equipped with either grab bucket or magnet. Charges are made up in steel buckets and taken by truck in orderly sequence to a point in the vicinity of the cupola. A mechanical charging device lifts each bucket in turn and dumps the contents into a cupola lined to 60 inches. Molten iron from the cupola is distributed to the various floors by ladles suspended from a monorail system.

Maintain Definite Sand Standards

In line with modern foundry practice which recognizes the fact that surface appearance is as important as any other casting requirement, definite standards have been set up for the physical properties and other characteristics of molding and core sand. Facing sand mixtures for various types of castings, core sand mixtures for a wide variety of cores ranging from simple to highly intricate shapes, are prepared in three units installed by the National Engineering Co., Chicago. A belt conveyor system for distribution of the sand to the molding and coremaking stations is in contemplation, but in the meantime the sand is loaded in wood boxes and delivered by truck to any desired location. New sand is stored in covered concrete bins where it is protected from the weather.

Metal for brass and bronze castings is melted in

Fig. 4 (Left)—Operators on each side of the drag set the cores. Also showing a drag mold with part of the intricate collection of cores in place. Fig. 5 (Below)—Cylinder blocks and heads are heat treated

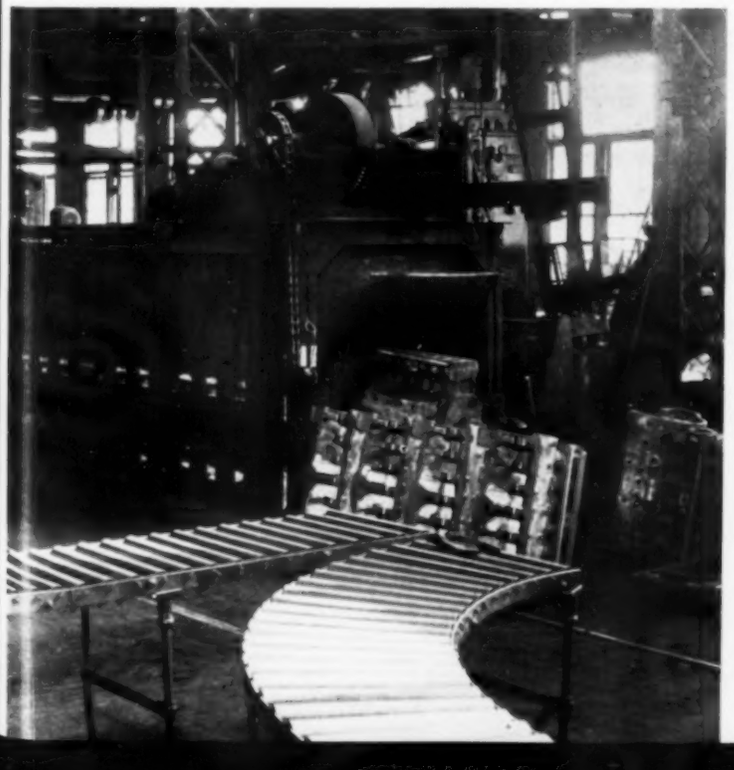


a battery of 8 oil fired tilting crucible furnaces in each of which a 350-pound capacity crucible with a long spout remains in place until worn to the point where replacement is necessary. Hand shank crucibles raised to a red heat are employed to take the metal from the furnaces to the molding floors in the vicinity. A special alloy metal for valve inset rings is melted in one of the furnaces where a temperature over 3000 degrees Fahr. is attained. It is claimed this metal is resistant to corrosion, wear, creep and high temperature. The metal, one of the almost countless number of alloys developed for special purposes in recent years is neither iron nor steel in the ordinarily accepted definitions of these metals. The charge contains approximately 60 per cent steel, 40 per cent nickel, and shows a carbon content of 1.40 per cent.

Patterns for the rings are in the form of sleeves or bushings made up in various lengths and in a wide range of diameters. The molds are made entirely in green sand with the patterns mounted on both sides of metal matchplates. Degrees of accuracy required in these castings may be inferred from the statement that in the majority of instances they are simply broach finished on the inside. Obviously the slightest surface imperfection would cause rejection. Moisture content of the sand, permeability and density of ramming constitute the principal features in the successful production of these castings. The first two factors are subject to technological control. The third is one of the intangibles depending on the skill and experience of the operator.

Number of patterns on a plate varies according to the diameter of the unit. In all instances the sand space between the individual patterns is held to a minimum. After trying various types of gates and runners, simple, ornate, plain and highly involved, choice has settled (*Please turn to page* 72)

Fig. 6 (Above, right)—Close control is maintained over the metal. Tapping temperature is checked constantly by pyrometers to insure proper metal going to the molds. Fig. 7 (Below, right)—Pouring a mold



Gray Iron Metallurgical Practice

By C. H. LORIG
Supervising Metallurgist
Battelle Memorial Institute, Columbus, O.

This is the first of two articles from a paper presented by the author at a recent meeting of the Chicago Chapter of the American Foundrymen's association. The concluding article will appear in an early issue. The Editors

PRODUCTION of good gray iron castings has resulted from technical advances in the foundry industry. The foundry business has risen to its present plane of achievement rather slowly. Nevertheless, the movement to raise the standards of the industry as a whole is progressing at an accelerated rate. Standards of work are higher, while requirements of the consumer have been raised.

Control has become more precise. Knowledge of gray iron qualities and fitness for various services has been broadened. So has knowledge of demands of those who use the castings. Raw materials used in a foundry are being selected more carefully, and metal charges are proportioned so as to take into account closer composition control.

Methods Improved in Recent Years

Foundries are becoming mechanized with handling equipment and with other features that make for standardized production practices. New and better melting facilities now are available for those who care to use them. Sand control is general, whereas less than 20 years ago it did not exist.

It has been found that the properties of iron can be improved by controlling melting, by giving consideration to structure and distribution of graphite, by adding alloys, and by heat-treating practices. We have come to realize that gray cast iron has properties peculiarly its own and, therefore, that it fills an indispensible need in the engineering field. All this constitutes technical progress that has come gradually in the past. There is no question but that all foundries, no matter how small, have profited in some way or other by this prog-

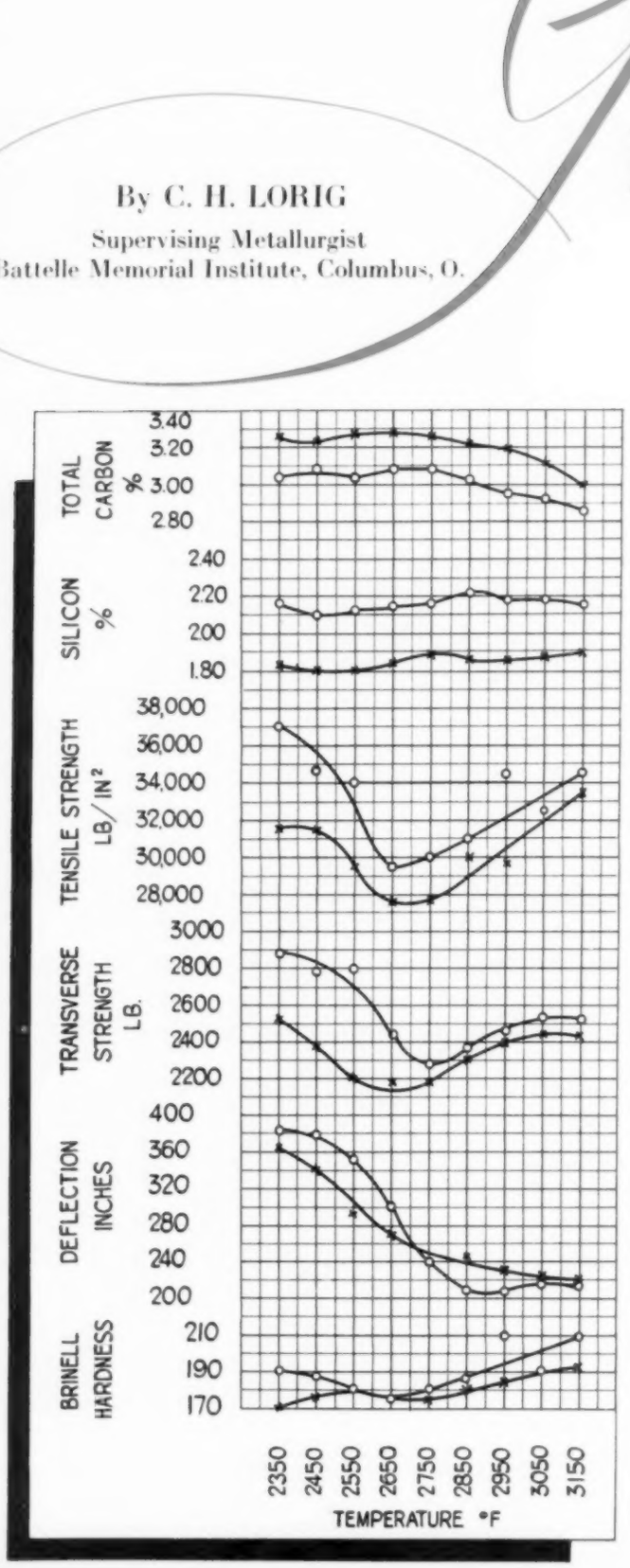


Fig. 1—Relation of metal temperature to the mechanical properties of high-frequency furnace cast irons with no ladle treatment

ress and that if they continue to prosper they must make greater use of it in the future.

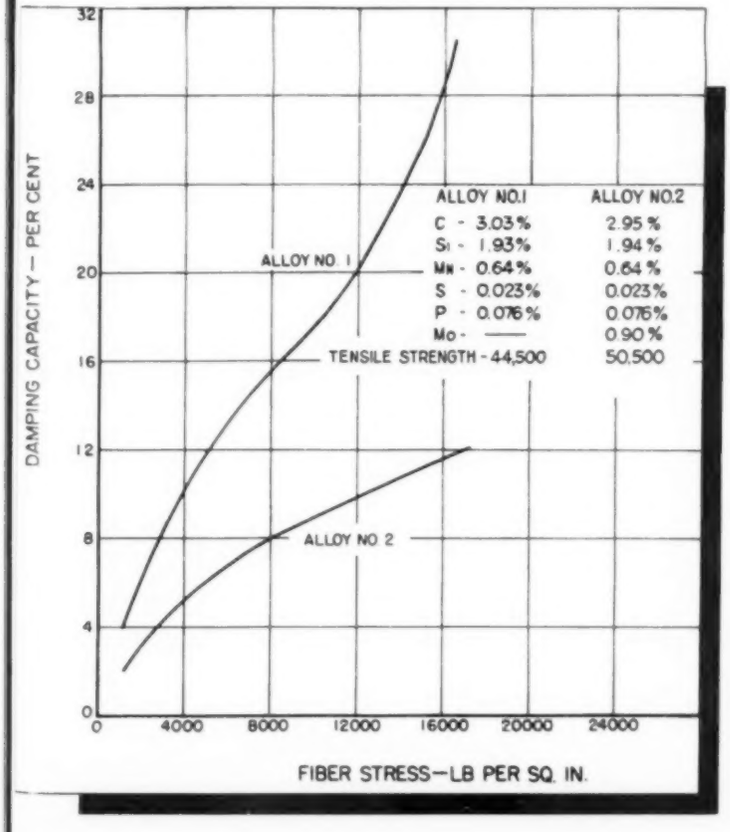
In utilizing progressive methods, the large production or repetition foundries have certain advantages over jobbing and small foundries. Such methods are easier to set up and maintain in foundries where production is on a large scale and where the jobs are long. In jobbing foundries, on the other hand, work is uphill with frequent changes not only in the type of job but also in the composition and quality of the iron being poured.

What the engineer demands of gray cast iron is performance. Therefore, castings must be supplied with qualities that were assumed in their design for the particular application. To have some guarantee of those qualities, the engineer naturally looks toward the reliability of the foundry, and often this reliability varies directly with the degree of metallurgical control which is practiced.

Producing good castings depends more and more upon meeting certain engineering needs. Hence one of the obvious ways to go about selecting irons for castings is to know something about their engineering behavior. Recommendation of irons on the basis of engineering qualities is becoming easier, but we still lack a great deal of information on service performances of various grades of iron upon which to base selections. Misapplication of irons will occur less often as we become more familiar with their potential qualifications and can manufacture them to closer specifications.

Metallurgical progress has had a twofold influence in improving this situation. It has aided development

Fig. 2—Damping capacity of two gray cast irons of different tensile strengths as a function of fiber stress



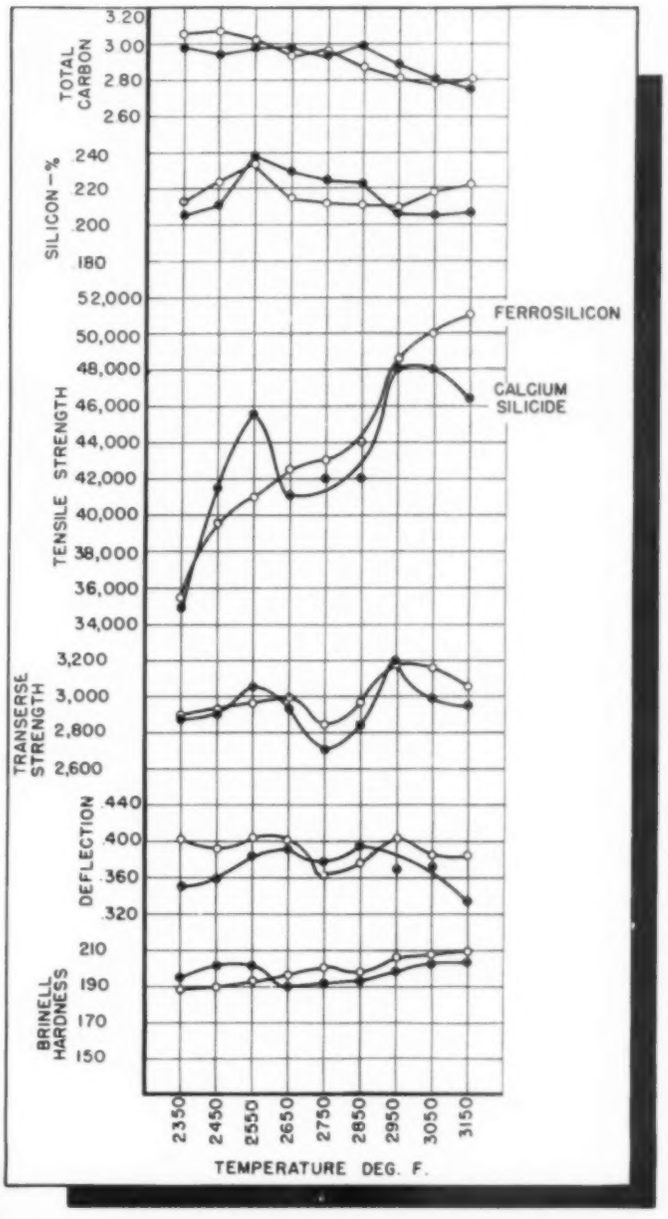


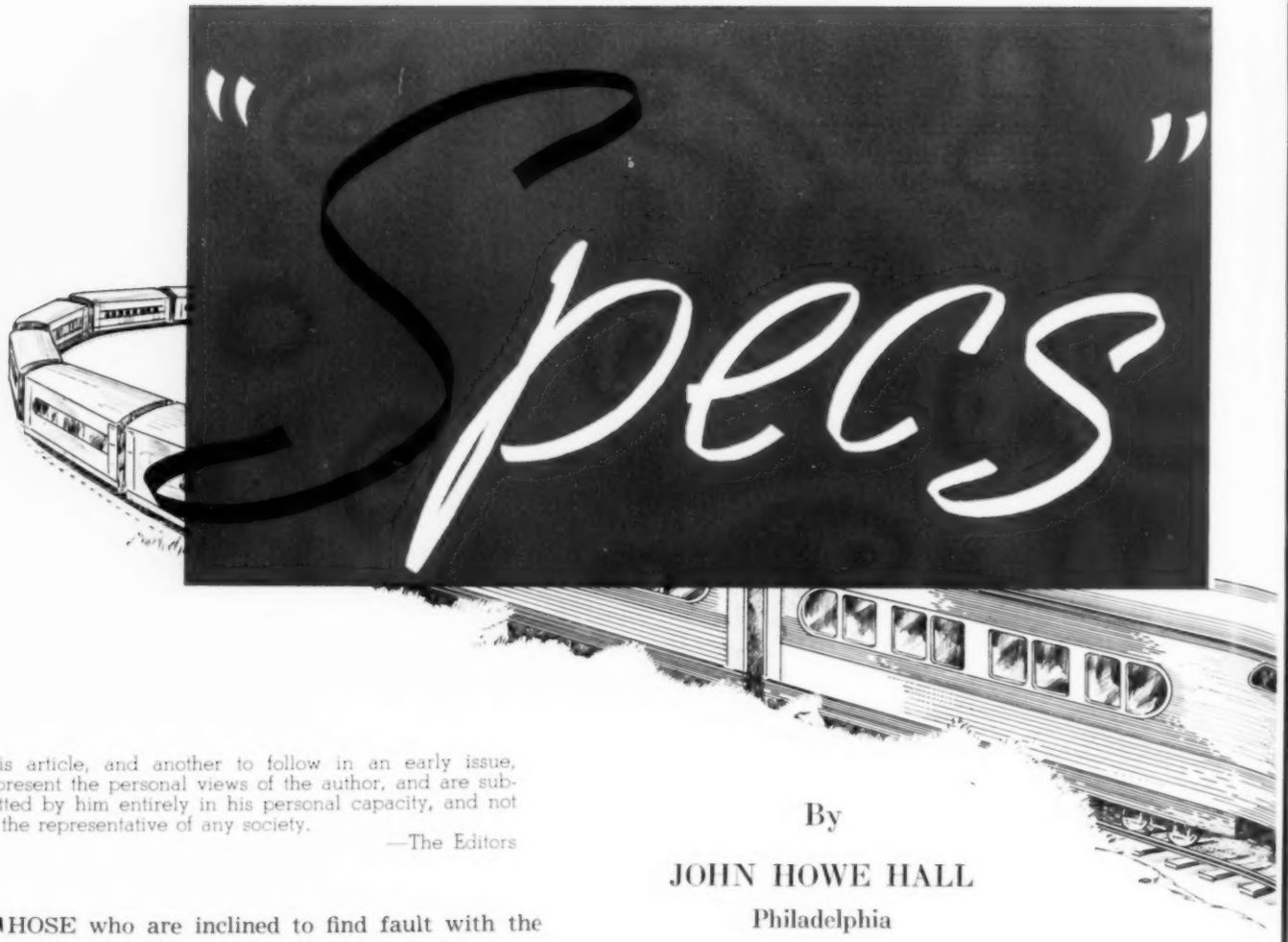
Fig. 3—Relation of metal temperature to mechanical properties of high-frequency furnace cast irons to which ferrosilicon and calcium silicide were added to the ladle

of higher quality irons of enhanced properties and has provided the urge to learn more about gray iron properties as they affect service performance. Progress of this kind has profoundly influenced trends in the gray iron industry.

One phase in the improvement of gray iron has been the development of the high-test irons. Merica, a year ago in his Howe Lecture, *Transactions*, A.I.M.E., Iron and Steel division, 1937, estimated that the yearly volume of production of high-test gray iron may be divided as follows: About 1,000,000 to 1,500,000 tons of alloy cast iron and, conservatively, 500,000 tons of unalloyed high-test iron. This represents from 15 to 20 per cent of the year's production. One metallurgist has predicted that before long more than 50 per cent of all gray iron will be of the high-test variety.

Metallurgical control of gray cast iron has brought about a decided change in (*Please turn to page* 76)

"Specs"



This article, and another to follow in an early issue, represent the personal views of the author, and are submitted by him entirely in his personal capacity, and not as the representative of any society.

—The Editors

By

JOHN HOWE HALL

Philadelphia

THOSE who are inclined to find fault with the requirements of modern specifications for materials, often have no realization of the situation that existed before the formation of the organizations responsible for formulating these specifications. Before these organizations existed, each buyer was a law onto himself, and the seller who wished to obtain a share of the business offered was obliged to conform as best he might to the requirements of the individual customer.

Details of these private specifications frequently were dictated by whimsies of the buyer's employes; restrictive clauses were introduced that called for special materials unsuited to other customers' requirements; and worst of all, the properties demanded of the materials often were fixed, not by what could and should be supplied for the particular article, but by what the buyer's staff mistakenly supposed the properties of a suitable material should be.

Naturally, the result was a tremendous gulf of misunderstanding between buyer and seller, the former often trying to secure improved materials each time he placed any business by demanding properties just a little higher than those attained on the last order, the wretched seller striving to meet the demands made upon him, and at the same time supply a material that would stand up in service, and so *stay sold.*

The author well recalls the days when purchasers of puddled stay-bolt iron suffered from a sort of tensile strength complex, supposing that better service would be secured from the iron if the ultimate strength were to be pushed up just a couple of thousand pounds per square inch above the figures of the last lot purchased. To the seller's representations that greater purity of material in puddled iron, and better puddling practice, more often than not resulted in lower, rather than higher tensile strength, the buyer turned a deaf ear, ascribing to the seller only the desire to supply inferior iron, and utterly disbelieving the plea that improved ductility was a better measure of the value of the product than higher tensile strength.

Partial To Curly Tail Pigs

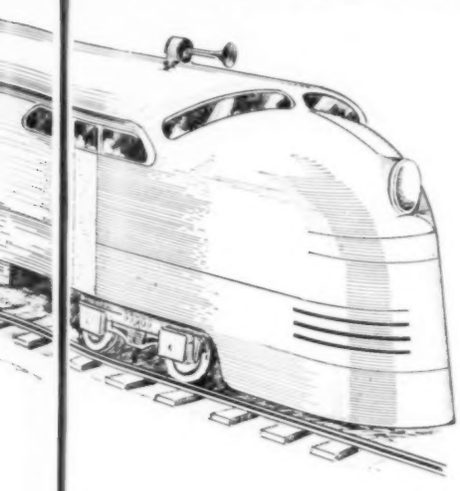
By the very necessities of his situation, the maker was driven to devious expedients to satisfy his customer, yet still supply iron that would *deliver the goods* in service. The mill men, unable to incorporate steel bars in their slab or box piles, knew to a nicety how many bars made from *curly-tail pigs* would be required to secure a given increase in tensile strength from the piles that were to be rolled down to staybolt iron.

Curly-tail pigs were heavy steel turnings, which were busheled on the night turn and rolled to muckbar only distinguishable from genuine puddled iron by acid etch and other tests not then familiar to customer's inspectors. Unusually low finishing temperatures in the rolling mill, too, would give the tensile strength a kick up, and the fine art of steering inspectors to the *red,* (cold finished), rather than the

blue (hot finished), bars on the cooling beds, generally by appearing to be unduly anxious that the *blue* be chosen, was one of the first lessons we had to learn in the puddle mill.

Similarly, it was just beginning to be known in the steel foundries that normalizing gave higher tensile strength than slow furnace cooling, and the old annealing pits often were opened, openly or surreptiously as the necessities of the case demanded, to get a fast cool on a judiciously located coupon or two, whose properties would determine acceptance or rejection of a lot of castings. The reader may fill in the picture from his own recollections, not forgetting the fortunately always very rare cases of downright *faking* that one sometimes heard rumored, but seldom encountered in actual practice.

Just recently an example of the sort of reasoning that results in a call for *upping* some property, with no well-refined idea of the desirability of the change, cropped up in the steel foundry trade. Certain buyers' engineers noted that a well known specification was being met fairly easily in the tensile strength clause and proposed a 5000 pound jack-up of the tensile strength requirement without any compensating adjustment in other physical properties.



The idea appeared to be that, because the majority of the tests were running a shade over 75,000 pounds per square inch, the minimum figure might as well be 75,000 instead of 70,000. There had been no fault found with the quality of the castings received under the old requirements, but the thought seemed to prevail that if a 70,000 pounds per square inch steel was good, a 75,000 pound steel would be better. Fortunately, after adequate discussion, the proposal was dropped; but the incident illustrates the old attitude.

To meet this situation to the satisfaction alike of buyer and seller was the purpose of the far-sighted group that incorporated the American Society for Testing Materials, with the all-important proviso that specifications put out by that body should be drawn up by committees on which producers and consumers should be represented equally. The existence of that society is so taken for granted today that it is difficult to realize it was organized under its present name only in 1902, succeeding an American branch of the International Association for Testing Materials, dating from 1898.

Indeed, the whole subject of materials testing is so new that it was only in 1882, within the life-time of men still active in industry, that the first meeting to discuss the subject of uniform methods of testing, was held in Europe. Howe, Dudley, Marburg, Lesley, Merriman, Colby, Webster, all now gone to your reward, perhaps no product of your genius will outlive this, the Society that you founded, and labored so hard to support!

Procedure of A. S. T. M. committees sometimes has been objected to as slow, tedius and time-consuming, and the wise provision for approval of specifications by vote of the entire membership in annual meetings, and subsequent letter ballot, also has been criticized. However, to one who has been through the heat and smoke of some the livelier discussions in committees and annual meetings, the result of these provisions for securing unanimity of opinion, is in abiding faith in the fairness to all concerned of the society's *Specs*.

Knowing from actual experience that a determined minority, even if outvoted in committee by the necessary margins, can come to an annual meeting and persuade the membership to refer a doubtful specification back to the committee for further consideration, the writer can assure any inquirer that A. S. T. M. specifications are as fair to all concerned as anything can be in this world of ours.

They have to be,—if they were not, the aggrieved parties would set up such a howl that the objectionable clauses never would be adopted. Shades of the old corrosion committee, what discussions we used to listen to when ingot iron and copper-bearing steel were being born, and the proud parents were extolling the virtues of the children of their brains and their hands,—with not a few back-handers at the other fellow's product, usually returned with interest!

Danger in Adopting Restrictive Clauses

Perhaps no feature of a specification can be more troublesome than clauses that attempt to prescribe *how* properties shall be obtained, as well as *what* the properties shall be. Restrictive process clauses which outlaw methods that in skillful hands can and do produce materials conforming in every way to the properties desired, and giving satisfaction in service, are a case in point. Sometimes the individual specifications may be beyond criticism, like the A. S. T. M. specification A95-36 for cast steel valves, flanges and fittings for high temperature service, in which the converter is not among the permissible steelmaking processes, unless expressly approved by the purchaser.

In-as-much as no converter foundries were in the business of furnishing these fittings when the specification was adopted, and the purchasers apparently were a unit in desiring open hearth or electric furnace steel, the unanimity of opinion required for the adoption of an A. S. T. M. specification finally was secured.

Though a clear case can be made out for the restrictive clause in this specification on the ground of unanimity of opinion on the part of the producers and consumers concerned, yet a doubt of the wisdom of having adopted the clause on broad general grounds has always remained. Those who opposed its adoption have felt that a society of national and international standing should not have put itself in the position of being judge and jury in con- (*Please turn to page* 80)

By N. K. B. PATCH

Nonferrous Foundry Has Wide Range Of Alloys Available

COMPOSITIONS *EE* to *OO* inclusive, as shown in Tables III and IV, comprise a series of tin bronzes. The term tin bronze is used to indicate that they are compositions of copper and tin with only a fraction of other small percentages of other elements present but are essentially copper tin alloys. It will be noted that most of these contain some phosphorus and most all of them are made by deoxidizing the copper with phosphorus before adding the tin.

Percentage of phosphorus indicated for each of these alloys is that to be expected in the final alloy, but it quite generally is the practice to use phosphorus as a deoxidizing agent in practically all of these alloys with the exception of composition *FF*, *GG*, *KK* and *LL*. These are deoxidized with zinc, although some manufacturers of these alloys even have a trace of phosphorus added to the copper before the tin is added, a practice which is much debated.

Object To Phosphorus and Zinc

Many metallurgists object to the presence of both phosphorus and zinc in the same composition, contending that they are antagonistic to one another insofar as the production of clean, satisfactory commercial castings is concerned. Other metallurgists are of the opinion that a trace of phosphorus in zinc deoxidized copper tin bronze is not objectionable, but on the contrary tends to increase fluidity so that the castings are more readily poured at a low temperature.

Composition *EE* is essentially 95 per cent copper, 5 per cent tin, deoxidized with phosphorus, permitting up to 0.3 per cent of phosphorus for this deoxidizing purpose. This composition is essentially a copper hardened with tin and as such is used for places where the pure copper color is desirable and where pure copper itself is not quite hard enough for the service.

Composition *FF* is the U. S. government composition known as 88-8-4. The old composition (88-10-2) changed so that the high tin content has been reduced to the point where the percentage of delta constituent in the alloy is not so pronounced and substituting for this reduction in the tin an addition of 2 per cent zinc. This tends to make an alloy that is less likely to leak under hydrostatic pressure through the small interstices developed by the crystallization of the delta constituent. The old 88-10-2 did develop this delta crystal so that in some instances it was necessary to absorb it by heat treatment if the castings were to be subjected to hydrostatic pressure service. In an endeavor to develop an alloy that would not exhibit these characteristics, it was changed so as to conform to this composition *FF*. This alloy is covered by the federal specification QQB 691a (5), but this specification permits nickel up to 1 per cent, although it does not require it. Obviously, if nickel is added, it is substituted for an equivalent amount of copper. The tin and zinc remain as indicated. These federal specifications also permit phosphorus up to 0.05 per cent maximum, but like nickel, phosphorus is not required and not usually present in this alloy even when nickel is present.

Used for Wide Variety

This alloy also is covered by specifications A.S.T.M. B60-36. It is used commonly for the production of a wide variety of castings, such as small gears that are not subject to heavy duty, parts that are subject to water pressure or hydrostatic stresses. It makes an excellent alloy for valve parts, although more expensive than materials previously described as valve bronze. With the small percentage of nickel present, the grain structure is fine and satiny and the material is very dense if properly manufactured.

Composition *GG* is the standard 88-10-2 alloy, a copper-tin bronze deoxidized with zinc, covered by a wide variety of different specifications, such as S.A.E. 62, A.S.T.M. B22-36T (d). In the federal specifications QQB-691a this composition is also covered by the same specification as *FF* since the limits on all three, copper, tin and zinc are such that either *FF* or *GG* may be produced and also on this 691a specification, alloy 6 and 6X embrace these two compositions; the difference in these being the rejection limits set up for the physical properties.

It should be borne in mind that all such specifications list physical properties required for these alloys, which are rejection limits below which the compositions must not go. Such figures do not represent the true physical properties for the average test bars for these materials, but are essentially indicative of the figures to be expected when the material is not up to average conditions.

Composition *GG* is by reason of the increased tin harder than composition *FF* (*Please turn to page* 84)

AMONG DETROIT FOUNDRIES

By A. H. ALLEN
Detroit Editor, The Foundry

HEARTENING to at least a few foundries in the Detroit area, struggling through months of operations at 40 per cent or less, have been the first dribbles from die programs for 1940 models released by motor car manufacturers. Die suppliers usually get the first inkling of plans for the ensuing model year, in the form of prints for figuring costs. In recent weeks, these prints have been coming out in increasing volume. Buick, Chevrolet, Chrysler divisions, Packard and some others now have jobs being figured, and some die business has been placed.

Extent of proposed changes at the present point is not entirely clear, but it is considered likely style revisions will be numerous. For one thing, retail sales of cars have been holding at a good rate, and there should be no inclination to stint on new designs because of a poor sales outlook. For another thing, executives of one or two companies have been reported dissatisfied with 1939 designs and anxious to bring this year's run to a close without delay, so that early introduction of revamped 1940 models can be effected.

New Models May Appear Early

A still more important factor is seen in the two World's Fairs being held this year with the prospect of attracting millions of visitors this summer and fall. Motor manufacturers are spending millions of dollars on these fairs as advertising mediums, and it is only smart merchandising to have something new to offer fair visitors as soon as possible. So, probably by the middle of July, you can look for some 1940 automobile models putting in appearance at the New York and San Francisco extravaganzas.

Already the date of the annual New York auto show has been moved up three weeks to Oct. 15, and the word has gone out to speed up new model programs commensurately. This means that foundries, as well as a whole host of kindred industries, should experience some good automotive business in the next two or three months in connection with tooling up for new designs.

Several programs of equipment rehabilitation in automotive foundries are being considered at the moment. Cadillac, for example, is proposing to spend in the neighborhood of $150,000 for extensive modernization of facilities, principally in the direction of sand handling and conditioning. The Cadillac foundry in Detroit has made some rather remarkable progress toward cost reduction in the past year or so, reports indicating that savings of around $10 per ton of iron melted have been achieved. Equipment now being proposed for installation should make for still further economy and also permit increased production.

Discuss a Rebuilding Program

Chevrolet gray iron foundry in Saginaw, Mich., also is understood to have shown a fair profit on operations the past year, and a moderate program of new equipment is being considered, although at present this foundry is little short of ideal as far as facilities are concerned.

Some discussion is heard of a rebuilding program at the Packard foundry, although nothing definite has been decided. Production of a new light-six model, now being worked out prior to introduction later this year, probably will tax present melting, molding and cleaning facilities seriously. The plan has been discussed, at least casually, of tearing down the present cleaning room and erecting a new foundry on that spot, which would permit rearrangement of present departments to handle increased production of cylinder blocks, flywheels and other castings.

Packard has released a good-size die program for this new light six, some local foundries participating, although within the past week or two, part of this work has been called back for changes. The hold-up is believed to be only temporary, as work is proceeding on revamping por- (*Please turn to page* 100)

Foundry Industry March of

WHAT will be the direction of future progress in the foundry industry? Probably the best answer to that question may be secured through a study of recent trends in the manufacture of cast products. With that thought in mind, interesting comments of a number of leaders in the foundry and allied fields on the progress made in the development of both foundry practices and products were presented in the February issue of THE FOUNDRY. Additional comments are presented in the following pages.

Quality and Uniformity of Malleable Castings Are Being Improved

By F. O. PARKER
Sales Manager
Acme Steel & Malleable Iron Works, Buffalo

DUE TO new equipment, improved foundry practice, and better metallurgical control, malleable iron castings constantly are being improved in quality and uniformity.

During 1938, the Malleable Founders' society has held in various sections of the country group shop practice meetings to better manufacturing practice. Each member plant has been visited periodically by a shop practice engineer to check up on individual performances.

New equipment in the foundry, cleaning department, and annealing department, as well as improved production methods have enabled the malleable iron producer to cut down the length of time necessary for shipments.

Many malleable foundries have made considerable progress in manufacturing pearlitic irons. Parts formerly made of other materials are now being made of alloy irons. Some such parts are crankshafts, camshafts, rocker arms, gears and sprockets, etc.

We look forward to the future with a great deal of confidence. We expect to find many new uses for malleable iron and plans are now being made to acquaint the engineering public with them. Publicity concerning physical, shock resisting, machining, corrosion resisting properties of malleable iron never has been stressed properly and this we expect to do.

Important Developments Have Occurred In the Gray Cast Iron Field

By R. S. MACPHERRAN
Chief Chemist
Allis-Chalmers Mfg. Co., Milwaukee

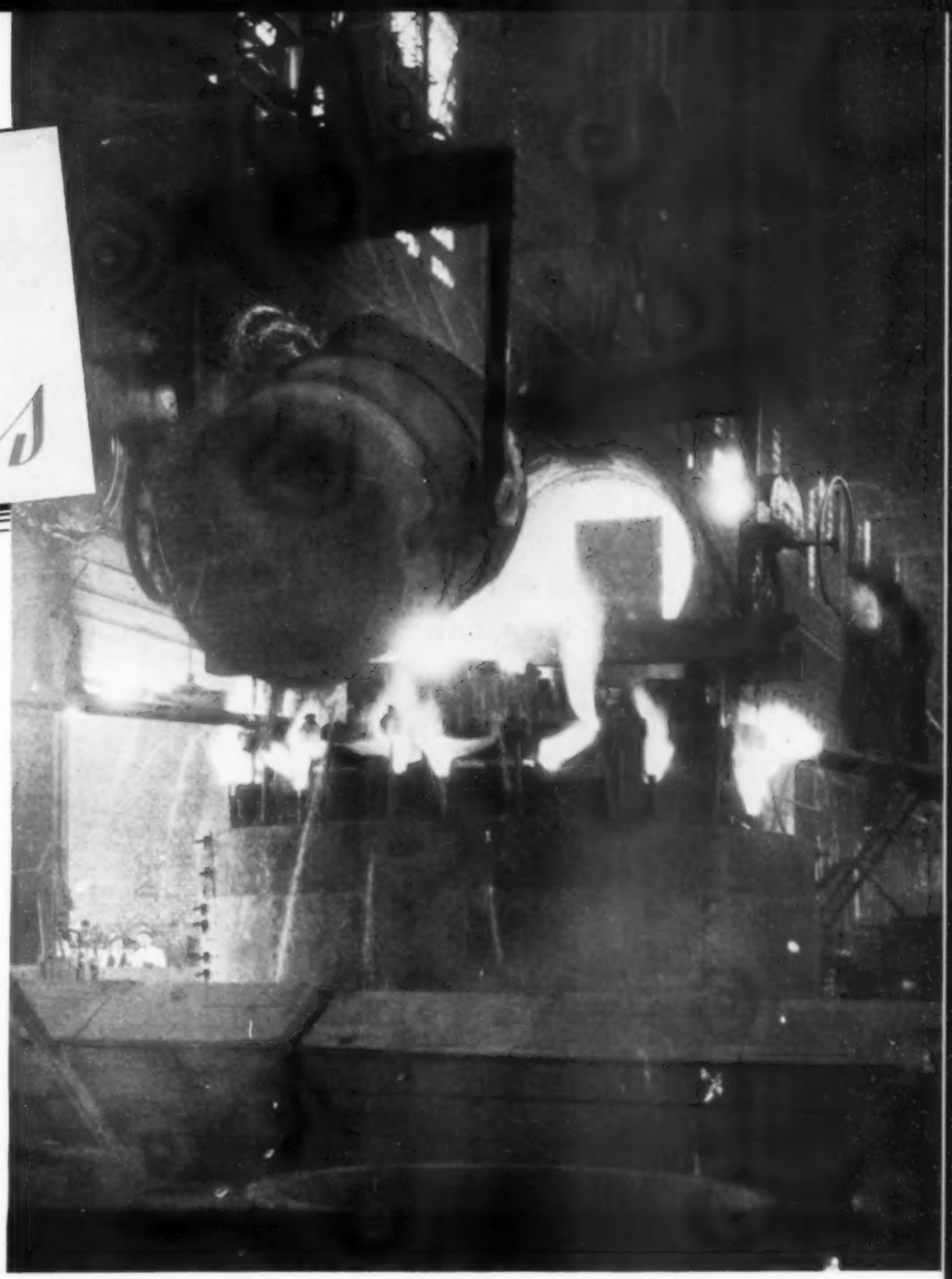
THE past year has seen some important developments. Perhaps the most noteworthy are the further development of the use of molds made from Portland cement and sand, flame hardening of cast iron, and the continued growth in the use of alloyed iron. We no longer need look to Europe. This country is fully abreast of the times and in both quality and strength, can hold its own with any.

Steel Casting Industry Shows Several Valuable Technical Developments

By CHARLES W. BRIGGS
Technical Adviser
Steel Founders' Society of America, Cleveland

THERE have been a number of outstanding technical developments in the steel casting industry during the year. Perhaps the most important is the third report of the steel casting committee of the British Iron and Steel institute which contained studies on the fluidity of iron-carbon alloys and steels, the properties of copper-steel castings, a continuation of the work on the strength and ductility of cast steel during cooling from the liquid state in sand

y Continues *Progress*



molds, and a report of the molding materials committee.

Some valuable information on the use of aluminum for deoxidation and at the same time maintaining high ductility values in steel castings was presented by Sims and Dahle.

During the year reports were made on the subject of design and the relief of stresses. A set of design rules that the engineer may follow in designing steel castings was presented by Briggs, Gezelius and Donaldson. The relief of internal stress resulting from contraction of steel castings was discussed by Machin and Oldham and Benson and Allison.

Studies on the effect of alloys and heat treatments on the mechanical properties of steel castings was pursued actively during the year with Malcolm presenting some interesting information on the effect of low temperature on the properties of cast steel, and Stewart discussing the higher temperature properties of some alloy cast steels. Some long needed information on the effect of mass upon the mechanical properties of cast steel also was presented by Briggs and Gezelius.

Advancements have been made in steel foundry practice during the year. Considerable application is being made of the cast-weld construction wherein a complicated structure may be produced by welding a number of steel castings together. Also an increasing number of applications show that steel castings are replacing built-up constructions. Considerable interest is being exhibited in the centrifugal casting of steel. The method is well adapted to the production of gears and wheels. A number of high alloy steel castings are also being produced centrifugally.

Sands for steel casting manufacture have been studied consistently and some worthwhile information has been developed. Hudson has continued his studies of the practical value of controlling the properties of molding sands at elevated temperatures and Dietert, Woodliff and Schuch have presented information on the properties of 33 sands which are being used in commercial steel foundries. The durability of sands was discussed by Schubert and some factors and methods of sand testing have been reported on by Walker and Buchanan.

The industry has been interested in new foundry production equipment especially in regards to reducing cleaning room costs and producing better working conditions with considerable thought being given to the problem of dust hazards.

The operating executives of the steel casting industry in America have been exchanging in monthly meetings, technical information with the dual purpose of improving the (*Please turn to page* 88)

QUESTIONS and ANSWERS

Desires Facing Mixtures For Green and Dry Sand Molds

Will you recommend a green sand facing for light and medium steel castings, and also a dry sand facing for valves weighing from 10 to 300 pounds each? The cost is not as important as it is to obtain smooth castings.

For a green sand facing mixture for your steel castings we suggest one comprised of 1000 pounds of washed silica sand, about 30 to 60 mesh, 30 pounds of bentonite, and 10 pounds of cereal binder. The moisture should not be over 3 per cent. A suitable dry sand mixture will be composed of 1800 pounds of washed silica sand, 25 pounds of bentonite, 14 quarts of core oil, and 400 pounds of silica flour. Bake at not over 600 degrees Fahr. Wash before and after drying with the following mixture: 60 quarts of water, 200 pounds of silica flour, 3 quarts of bentonite, and 3 quarts of cereal binder.

Discoloration in Bar Results From Carried In Dross

We are sending to you a brass specimen which showed a discolored fracture when tested. The specimen was cast according to A.S.T.M. B62-36, gated at one end of the large section with a riser on the other end. The analysis of the metal showed 83.67 per cent copper, 4.82 per cent tin, 5.46 per cent lead, and 5.34 per cent zinc. Metal was poured at 2000 degrees Fahr. Phosphor-copper and zinc were added 5 minutes before pouring. Metal melted in an oil-fired furnace.

Examination of a fresh fracture on the specimen submitted indicates a normal fracture for the 85-5-5-5 alloy. Since the bar did not break close to the middle in the testing machine, and as you mention was discolored, it is an indication that the bar was less clean at the particular section involved. That points to the source of trouble as being gating and pouring rather than the quality of the metal.

In our opinion you will get more comparable tests if you employ the Webbert bar which has a riser extending over the full length of the bar. The riser is connected to the bar with a web about 3/16-inch thick. The gate should enter the end of the bar, and be of a size to permit free and quiet entry of the metal. First metal to enter the gate should be deflected so that it does not enter the bar and carry in sand, dross, dirt, etc.

If such practice is followed, relative values of different heats of the same alloy will be readily comparable since the test bars will be nearly standard, and will produce concordant results in the testing machines. While your alloy is somewhat low in tin content, that is not unusual since tin is the most costly ingredient, and the reduction in that element reduces the cost to some extent. As pointed out, your difficulty lies in the method of making the test bar and not in the metal.

Desired To Get Hot Metal from Small Diameter Cupola

We cannot get hot iron from a cupola lined to 19 inches equipped with four tuyeres 3½ x 4 inches. The tuyeres are 12½ inches from the bottom. Slag hole 10 inches above the bottom. We charge 400 pounds of iron, 60 pounds coke, 15 pounds limestone. The blast pressure is 4 ounces but we have no way of gaging the volume. How much iron can be stored in the well of the cupola. Is it advisable to raise the tuyeres 4 inches so that the well will hold a greater amount. If necessary, where can we procure an instrument for measuring the air volume.

Inability to secure hot iron may be due to one or to a combination of several factors. Instead of guessing which factor or combination of factors is responsible, we shall outline briefly the correct method for operating the cupola. Incidentally you do not mention the height of the coke bed and we are inclined to the opinion that a low bed and heavy iron charges are the underlying cause of your present trouble.

About two thirds of the required coke bed is placed on top of the wood before the fire is lighted. After the wood is burned away, and the coke red all the way through has settled down the remainder of the bed coke is added. The top of this coke should extend to a point approximately 3 feet above the tuyeres.

The first charge of iron is placed immediately, followed by successive charges of coke and iron until the cupola is filled to the charging door. To determine the proper weight of the charges, set up a ring of bricks, the same diameter as the cupola, on the charging floor or on a board. The ordinary

fire brick is approximately 4 inches high when placed on edge. Fill the ring level full of coke. That is the correct amount for a charge. The amount is weighed or measured in any convenient manner and used as a standard.

The iron charge will weigh from 8 to 10 times the weight of the coke. The melting capacity of a 19-inch diameter cupola is approximately 2000 pounds per hour and for that you will require 500 cubic feet of air per minute. The maker of your blower can give you the capacity of your present unit, the proper operating speed to secure maximum results, or alternatively he can tell you what size fan is required for your purpose. The present well of the cupola will hold approximately 300 pounds of iron. Raising the slag hole 4 inches will increase the capacity to approximately 500 pounds.

Information on Patterns for Piston Rings Is Desired

Can you give me, or tell me where I can get published information on how to figure and make patterns for light, individually cast piston rings?

We regret that we do not know of any published material on the subject of individually cast light piston ring patterns. At one prominent plant the wood master patterns are turned in the usual manner and used to make gray iron castings. The cast iron ring patterns are cut, sprung apart and a small, flat piece inserted to compensate for the subsequent cut in the finished ring. The rings then are attached to the heavy cast iron pattern plate and the molds are made on squeezer machines. The molds are stacked approximately 18 high and the bottom of one section forms the cope of the section immediately beneath.

In the subsequent machining operation the ring is cut at the flat place and the ends are brought together to form a circle. The rings are gated at the flat place. On practically all rings it is customary to attach a *pollywog* riser to the pattern at a point opposite the gate. This prevents chill and cold shut at the point where the two streams of iron meet. So far as we know there is no standard rule by which the patternmaker can determine in advance the size of the flat piece. An experienced man can make a pretty shrewd guess, but in many instances some experimenting is necessary.

Making Aluminum Matchplates In Plaster Molds Described

We saw a reference some time ago to aluminum matchplates being made in plaster molds and cast under pressure. We are interested in learning how it is done, and whether it is a patented process.

Since the use of plaster as a molding material is an exceedingly old practice, we do not believe that its application for making pattern plates can be patented. However, it is possible that the mechanism for injecting the molten metal under pressure may be. While we do not have any definite information on that point, we believe that the procedure is similar to that of die casting under pressure, except that the pressures are not as great.

Manufacture of plaster molds requires considerable skill which can be acquired through practice. Plaster is used in liquid form, and a variety of compositions are used. For example one is composed of 1 part plaster of paris, 2 parts brick dust, and water sufficient to make a pourable mixture. Another contains 7 parts plaster, 4 parts asbestos fibers, 1 part china clay and sufficient water. A third is comprised of 4 parts plaster, 1 part fireclay, 1 part asbestos fibers, and water.

In making the mold, the master pattern after being covered with a thin coat of oil or grease, is mounted suitably in a small box or frame which also has been oiled, and the liquid plaster poured around it. In a short time the plaster solidifies sufficiently so that it can be handled, and then it is removed from the frame and from the pattern. Following the same procedure, other molds are made until sufficient are available for the final matchplate.

Separate molds are air dried for about 24 hours and then baked at a high temperature from 900 to 1000 degrees Fahr. to drive off all moisture. Separate molds or blocks are assembled in a flask, thickness strips placed around the four edges, and a flat face flask placed in position. After clamping, the matchplate is ready for pouring.

Wants Wear Resisting Bronze With High Conductivity

We would like to know of a suitable bronze alloy for high electrical conductivity with wear-resisting qualities. We have in mind an alloy similar to that used for trolley wheels. Would you please advise what you would consider a good alloy for that purpose?

Fundamental requirements for high conductivity in copper is its purity. Alloying pure copper with any other material tends to reduce the conductivity. Hence, to alloy copper so that it becomes wear resistant or a bearing alloy means that its conductivity must be reduced. However, it is claimed that through the addition of small amounts of silicon and chromium conductivities of 85 per cent and over with high tensile strength and brinell hardness may be obtained. Other alloying agents such as silicon with nickel and cobalt, nickel with beryllium, and silver or cadmium with chromium are said to give similar results. The alloys usually are heat treated to obtain the desired properties.

Many trolley wheels are made from an alloy containing 93.5 per cent copper, and 6.5 per cent tin. That alloy has a conductivity of about 14.5 per cent as compared with standard pure copper. Even with 6.5 per cent tin added to the copper the bearing and wear resisting qualities are not of the highest. A much higher content of tin is needed. Thousands of trolley wheels also are made from red brass such as the 85-5-5-5 alloy, and while the conductivity is only about 12 per cent of that of copper, it seems to give fair results.

Take Shot Iron Out Of Facing Sand

We have been told shot iron and other small particles of iron in the sand are responsible for rough spots and occasional blowholes in some of our castings. We shall be interested in your opinion on this subject.

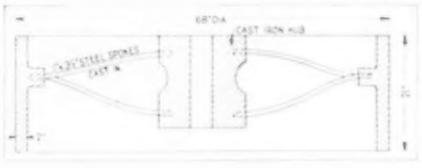
In a general way every foundryman is aware that contaminated sand is not as suitable as clean sand for making castings. Unfortunately in many instances, beset as he is with a multitude of problems every day, he is not alert as he might be to this particular feature. He regards the hazard as of minor imporance and instinctively shies away from any expense incident to the removal of foreign material. To some extent facing sand may be compared to a coat of paint. A customer would not accept a paint job where the paint is contaminated with chips, blobs, dust or other extraneous material.

Contaminated facing sand in intimate contact with the face of the casting produces dirty and spotty areas which detract from the appearance and thus affect the saleability of the casting. Shot iron and other miscellaneous small particles of metal impart a more or less chilling effect, particularly in thin castings. They are particularly objectionable due to the fact that they develop a coating of rust in the damp sand. This rust (iron oxide) is converted into gas by the heat of the molten metal. The gas is developed instantly and violently with consequent disruption of the sand in the vicinity, which in turn is reflected in the appearance of the surface of the casting. A certain amount of the gas may work its way through the metal, but some of the gas remains trapped to form blowholes in the casting.

Wheel Rim Is Cast Before the Hub

A customer wants us to cast a new rim on a steam roller wheel 68 inches diameter, 2 inches thick and 21 inches high. We would have to cut the steel spokes close to the rim, and then either weld extensions on the spokes or extend the lugs on the casting. We are doubtful on two points. The first is arranging and holding the present hub in correct position in regard to the new rim. The second is the probable effect of contraction while the rim is cooling. We shall appreciate any advice on the subject.

Advice on this subject can be summed up in one word, *don't*. The only practical solution of the problem is to make a complete wheel. The reason is that no person up to the present has found a way to get around the natural law of contraction while metal is passing from high to ordinary atmospheric temperature. If you were to place the existing hub and set of steel spokes in the mold — an awkward and clumsy job at best — the contracting rim would bend the spokes out of shape. If they all bent uniformly, the wheel still might pass, but unfortunately all the spokes will not bend uniformly. The result is



Attempt to cast a new rim around existing hub and spokes is impracticable

a set of crooked spokes and a hub off center.

In making wheels of this kind the ordinary practice is to cast the rim one day, and the hub on the following day. Contraction on the hub is negligible.

Chill Leaves Rough Place on Face

We have had trouble in securing a satisfactory coating for chillls used in connection with the molding of malleable iron castings. The old fashioned method of coating with oil and sand leaves an unsightly scar. What is the best all around material?

In the majority of instances no necessity exists for coating with sand, the face of the comparatively small chills used in a malleable foundry. In extreme instances, for example, where a stream of metal flows past or against a chill for a considerable period, the sand coating prevents the face of the chill from fusing to the casting. In ordinary foundry practice the sand coating is applied only to inserts designed to work loose later, for example the swivel heads on shackles. The sand coating provides a clearance space. That is its only function.

In ordinary routine production where comparatively small chills are applied to the outside of a casting, the composition of the coating material is a feature of minor importance. The major requirement is a chill that is perfectly dry and clean. If this precaution is observed, in many instances no coating is necessary. If this fundamental condition is not present, no chill coating will produce a satisfactory casting. With a clean chill a light coating of practically any kind of oil will prevent a deposit of dampness and consequent oxidation, the direct cause of blowholes. The oil may be sprayed, brushed or rubbed on with a rag or a handful of waste, or the chill may be dipped in the oil bath. However, under exceptional circumstances a specially prepared chil coating may prove advantageous The merits of several and the address of the manufacturers may be found in the advertising pages of THE FOUNDRY.

Steel Turnings for Cupola Charge

We will appreciate information on the various methods of using cast iron and steel borings and turnings in the cupola. We are familiar with the operation of the hydraulic briqueting machine. Can you refer us to any articles dealing with the method employed by steel companies in melting large amounts of this material. Can the method be employed in an iron foundry on a modified scale.

Taking up your questions in the order submitted, cast iron and steel borings and turnings are charged in the cupola in the natural state, in metal containers, or in briquets. Only a comparatively limited quantity can be used in the natural state. Cast iron borings filter down through the charges of coke and thus not only disturb the proper balance between coke and iron charges, but also may affect the analysis of the iron at the tap hole. Steel turnings occupy too much room for any given weight of charge and thus interfere with the proper and normal working of the cupola.

Fairly consistent results are obtained when the material is packed in metal containers which do not melt and release the contents until the charge has reached the melting zone. From a melting standpoint, the only satisfactory method of using the material is in briquet form. In a cupola the melting is all done from underneath and the layers of coke and iron must be maintained in close and orderly sequence. Conditions are radically different in steel plants where great quantities of miscellaneous materials are melted in open hearth or electric furnaces. Here the material is spread over a wide hearth area and melted by heat applied from above. Briefly, with proper care it is possible to incorporate and melt a limited amount of loose borings or turnings in the

cupola charge. However, even with small amounts, the briqueted material is preferable, and on large amounts is mandatory.

Boat Propeller Is Much Too Soft

For several years we have made motor boat propellers from 14 to 18 inches in diameter from heavy brass scrap. We have had fairly good success until lately when the same scrap has not been obtainable. The difference in the scrap has resulted in some being soft and bending in water. The motors on which they are used turn at 1800 to 2500 revolutions per minute. Would use of bronze shafting make suitable propellers or is there something that we could add to the scrap mixture to toughen it? We do not wish to make them too hard since they might break.

It is almost impossible to make a suggestion as to how you can improve the alloy for the service you describe without having more information. Why not have some of the satisfactory and unsatisfactory castings analyzed and determine the difference in the alloy. Then build up the unsatisfactory alloy by adding the necessary ingredients so as to conform with the satisfactory one.

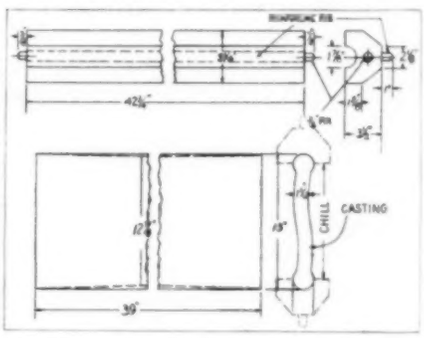
We believe you will find it to your advantage to abandon the use of unreliable scrap in favor of a reliable grade of ingot metal which is available from many manufacturers who standardize in the production of these ingot metals and who are prepared to give you an alloy suitable for your purpose. Once you have found such an ingot metal, you can buy that same ingot repeatedly and if you maintain a standard practice you should have an equally standard product which will satisfy your requirements. If, on the other hand, you continue to buy scrap, which you admit varies materially, you must expect to have a wide variety of castings unless you analyze each piece of scrap to determine its alloy content and then build that alloy to your requirements.

You mention bronze shafting. That term does not necessarily mean a standard alloy since there are different makers of this type of material, each of whom has his preference for a given alloy, or who has found that the trade prefers a certain alloy. If you mix the bronze from one maker with that of another, it is possible you would have an alloy that would vary materially in proportion to the ratio of the two different makes of bronze incorporated in the alloy.

Long Chill Expands From the Heat

We are having trouble with a peculiar form of shrinkage on the chilled edges of a toggle casting 1⅜ x 12⅞ x 39 inches. Casting and chill are shown in the accompanying illustration. Shrinkage on both sides is between $\frac{1}{16}$ and $\frac{1}{8}$-inch, as shown by the dotted lines. The chills now are bowed about $\frac{1}{16}$-inch in the opposite direction, but the distortion persists in the casting.

The slightly curved edges of the casting are not the result of shrinkage, but the direct opposite, expansion. That is expansion of the chill. In contact with the hot iron the inner face of the chill expands to form a slight bow. Before the toggle casting solidifies, the obverse of the bow is transferred to the edges. Later the chill cools off and resumes its former shape, thus concealing its action from the investigator. If used many times, of course, it will assume a permanent bow. You have a choice of two alternative methods for securing straight edges on the casting. The first is to provide a massive chill that will absorb the heat and thus resist distortion. The second is to either cast a new set of short chills, or cut the present chills into short lengths, say about 10 inches. In this case the new chills can be made rectangular in shape, instead of the present chamfered edges.



Heat causes the long chill to bow in the center and thus impart the reverse curve to the edge of the casting as shown in the dotted lines

Surface of Cores Is Too Open

We recently have had orders to make pump impellers, varying in sizes up to 600 pounds. Our trouble has been with the metal burning into the cores. We would appreciate your advice on how to overcome this condition. Our pouring temperature for 85-5-5-5 is 2100 degrees Fahr.

Burning of the metal into your cores indicates that the surface structure of the core is open enough to permit the entrance of metal. This is not apparent to the eye since until the heated metal touches the core, the openings are filled with combustible material which burns away and presents openings into which the metal enters.

An oil sand core made of pure silica sand and bonded with only the necessary quantity of core oil should give a core in which the combustible material is at a minimum. The pores in the cores through which the venting takes place will vary in accordance to the size of the sand particles used. If you need ample venting space due to the cores blowing, larger sized particles should form the major part of the core. If you do not have that trouble, a finer sand could be used which would leave smaller voids into which the metal will enter. Given a core made with a minimum amount of bonding material and a minimum amount of combustibles of any sort, the core should be surfaced carefully with a good grade of plumbago blacking or silica coating. This should be bonded to the core with a minimum amount of combustible material and applied carefully to cover all the voids.

Temperature at which you pour the 85-5-5-5 mixture is approximately correct, although you may find that there are cases where the castings are of sufficient weight and heavy enough in section to permit of colder pouring. In that case the colder pouring will reduce the tendency to burn into the core.

Vent the Cores To Carry Off Gas

We are forwarding for your inspection four pieces broken from radiator sections. We shall appreciate your opinion on the probable cause of and remedy for the defective spots, either blow holes or shrink holes or a combination of both.

From the evidence submitted with your inquiry we are inclined to the opinion that the sand in the drag is rammed too hard around the projecting ridge. A jet of steam enters the metal and immediately is surrounded by a thin film which prevents it from escaping. Appearance of the defect on the cope side in one specimen would seem to indicate that in this instance the flowing stream was sufficiently hot and liquid to carry the bubble away from the bottom side and deposit it on the top before the metal became sufficiently viscous to prevent any further movement. As a preliminary step in your further investigation we suggest ramming the sand softer along the ridge corners in the drag.

Robert J. Nelson

Martin J. Lefler

R. B. Simmons

H. H. Judson

MEN of INDUSTRY

R. B. SIMMONS has been appointed foundry superintendent, Nash Motors division, Nash Kelvinator Corp., Kenosha, Wis. Mr. Simmons started his career in the metal industry by working in the iron ore mines in Minnesota, gaining there considerable knowledge of iron. He served an apprenticeship under L. G. Blunt, Holmes Foundry Co., Port Huron, Mich., and soon was made foundry foreman. Later he was appointed assistant foundry superintendent, then foundry superintendent. The last 6 years he has served as vice president and production manager. Mr. Simmons has specialized in cylinder block castings and also has considerable experience with small castings.

♦ ♦ ♦

H. H. JUDSON, foundry superintendent, Goulds Pumps Inc., Seneca Falls, N. Y., has been made chairman of the newly organized Central New York chapter of A.F.A. Mr. Judson is a graduate of Worcester Polytechnic institute, 1923, receiving a bachelor of science degree in mechanical engineering. During the following 3 years he was foundry engineer, Riley Stoker Co., Detroit, and in 1926 became connected with Goulds Pumps Inc. as foundry superintendent. In 1936 Mr. Judson was the author of the annual A.F.A. exchange paper presented at the annual meeting of the Institute of British Foundrymen.

♦ ♦ ♦

MARTIN J. LEFLER, recently appointed general foundry superintendent, Western Foundry Co., Chicago, has been elected first chairman of the newly organized Indiana-Michigan chapter of A.F.A. Mr. Lefler is a graduate of Michigan State college, East Lansing, Mich., and started work as a laborer at Deere & Co., East Moline, Ill., advancing in several stages to the position of foundry superintendent of the malleable plant. Mr. Lefler also acted as assistant foundry superintendent of J. I. Case Threshing Machine Co., Racine, Wis. He went to the Oliver Farm Equipment Co., South Bend, Ind., in 1931, and became general foundry superintendent.

♦ ♦ ♦

ROBERT J. NELSON, treasurer, Arcade Malleable Iron Co. Inc., Worcester, Mass., recently was elected president, New England Foundrymen's association. Mr. Nelson first was connected with the foundry industry in 1913-14 when he was with Malleable Iron Fittings Co., Branford. Conn. He then was employed by the Beacon Falls Rubber Shoe Co., Beacon Falls, Conn. as payroll clerk. During 1916 to 1918 he served in the war as sergeant-major in the field artillery. After the war he again was associated with the Beacon Falls Rubber Shoe Co. until May, 1920 when he became connected with the Arcade Malleable Iron Co. In 1924 he was made assistant treasurer of the company and the following year took up duties of treasurer, which position he has held up to this time.

♦ ♦ ♦

G. R. JOHNSON, vice president in charge of sales and J. S. Wright, treasurer, Lynchburg Foundry Co., Lynchburg, Va., have retired.

♦ ♦ ♦

CHARLES W. PEARSON, vice president and sales manager, Buffalo Foundry & Machine Co. has been promoted to executive vice president and general manager. He is also a director of the company.

♦ ♦ ♦

ROBERT W. LEA, has been elected vice president in charge of finance, Johns-Manville Corp., New York. Mr. Lea was president, West Virginia Coal & Coke Co. of which he will remain a director.

♦ ♦ ♦

FENTON B. TURCK JR., vice president, American Radiator Corp. has resigned his position in that company to devote his entire time to Holland-American affairs of the company.

♦ ♦ ♦

ROBERT B. ELLISON recently has been made president, Ellison Bronze Co., Jamestown, N. Y. C. F. OLIVER ELLISON was made secretary and A. C. NORDSTROM, vice president and treasurer.

♦ ♦ ♦

FRITZ B. ERNST, vice president, American Steel Foundries, Chicago has been elected a director and a member of the executive committee, General Steel Castings Corp., Granite City, Ill.

♦ ♦ ♦

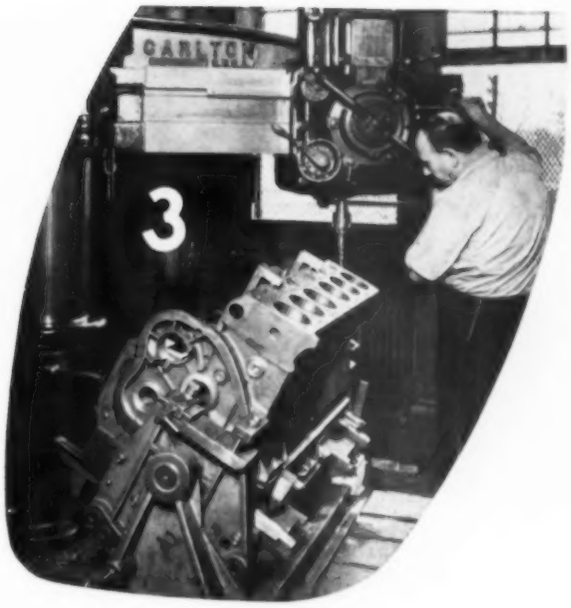
F. E. BLACKBURN has become associated with the sales department, Ohio Ferro-Alloys Corp., Canton, O., as sales engineer. Mr. Blackburn has had many years practical experience in the production of alloy and stainless steels.

♦ ♦ ♦

WILLIAM H. FOGARTY, formerly district manager, Chicago office of the Johns-Manville Co. has been made assistant to the vice president of J-M Sales Corp. In his new position Mr. Fogarty will continue to make his headquarters in Chicago. His position as district man-

(*Concluded on page* 40)

3 STEPS IN THE PRODUCTION OF BETTER CASTINGS



Step into the Mack Manufacturing Corporation's foundry at New Brunswick, N. J. where castings that need no coddling may be seen. For instance, cylinder blocks for heavy duty trucks are being made better—by adding Nickel to every melt.

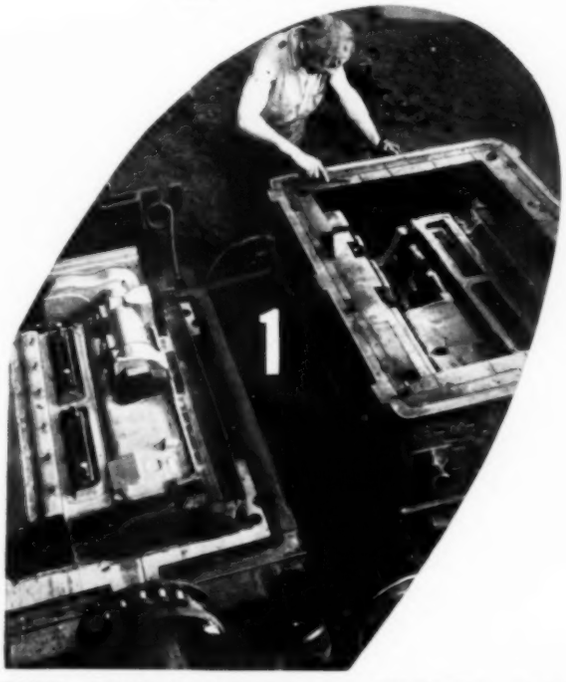
1 Accurate molds, skin hardened by a flame treatment, reduce amount of machining. Nickel assures uniformity, induces density throughout casting of intricate designs.

2 Accurate cupola control is a long step toward increased foundry profits. It also pays to determine the right composition for the work to be done by your castings. By using Nickel alone or with other alloys you can refine grain, elevate strength, and increase wear resistance. Mack checks temperatures carefully with this optical pyrometer—even though Nickel broadens the casting range of ferrous metals.

3 Accurate control of machining costs begins in the foundry. Mack radially drills this heavy duty cylinder block made of Nickel cast iron at speeds *1½ times faster* than that possible with other cast irons of similar hardness.

For helpful information on how to improve your castings and increase your cash profits, please address International Nickel's casting service staff.

NICKEL
CAST IRONS



THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL ST., NEW YORK, N. Y.

(*Concluded from page* 38)

ager will be taken by CORYDON H. HALL, formerly assistant sales manager, New York power products district.

• • •

JAMES P. RAUGH, formerly assistant general sales manager, General Refractories Co., Philadelphia, recently was appointed general sales manager of the company. FRED M. MILLER was appointed general works manager.

• • •

JOHN W. LOHNES recently was appointed assistant to general manager of sales, Vanadium Corp. of

John W. Lohnes

America. For the last three years Mr. Lohnes has been attached to the Chicago office of the Vanadium Corp. Prior to his association with that organization, he was with the Carnegie-Illinois Steel Corp., Chicago. Mr. Lohnes will make his headquarters in the main office of the Vanadium Corp. of America, 420 Lexington avenue, New York.

• • •

LOUIS W. FALK has been made executive engineer and W. B. Schmitter has been appointed chief engineer of the Falk Corp., Milwaukee. Harold S. Falk, vice president, continues in his present capacity as director of engineering.

• • •

R. DUREUIL, formerly engineer in charge of sandblast department, Ingersoll-Rand, Paris, France, has been made manager, Societe Aeromecanique, 16, avenue de la Republique, Rueil-Malmaison, manufacturers of sandblast equipment, dust arrestors, filters, fans, etc.

• • •

MICHAEL DWYER, minister of public works and mines and minister of labor in Nova Scotia government, recently announced his resignation to become president and general manager of the reorganized Nova Scotia Steel & Coal Co. Mr. Dwyer is a brother of Pat Dwyer, engineering editor of THE FOUNDRY.

• • •

DR. R. G. MINARIK has been appointed recently to the department of mechanical engineering, Armour institute, Chicago. Dr. Minarik is a graduate of Case School of Applied Science, received his master's degree from Yale university and his doctor's degree from the University of California.

• • •

FREDERICK W. COPELAND recently has been elected president, Sullivan Machinery Co., Michigan City, Ind. Mr. Copeland has resigned the presidency of H. Channon Co., Chicago, to take over his new duties. The following new directors also were elected: H. T. Walsh, J. W. Haddock, W. R. Jarvis and L. T. Noel.

• • •

FRANK M. URBAN has been appointed assistant manager, mechanical sales, Chicago branch of the mechanical goods division, United States Rubber Co. R. F. JACKSON has been appointed manager of mechanical sales of the Baltimore branch, mechanical goods division. The Baltimore branch, formerly under supervision of the Philadelphia office, will operate independently.

• • •

CHARLES B. BOHN, president, Bohn Aluminum & Brass Corp., Detroit, recently was elected president, Alu-

Charles B. Bohn

minum association, which includes important foundries and mills throughout the country.

• • •

E. CLAY HOWELL, recently has been elected vice president and general manager, Haven Malleable Castings Co., Cincinnati. Mr. Howell after some years of executive work with malleable iron firms was employed by the Malleable Founders' society, advising members on all phases of management and plant operations. During the past 2 years he has been dividing his time between two malleable iron companies as their technical advisor and on sales promotion work. William A. Haven is president of the company.

Nominate Washburn As A. F. A. Head

Nominating committee of the American Foundrymen's association recently met in Chicago and nominated officers for 1939-40. H. S. Washburn, vice president of the A.F.A. and president, Plainville Casting Co., Plainville, Conn., was nominated for president and Lester N. Shannon, director of the A.F.A. and vice president, Stockham Pipe Fittings Co., Birmingham, Ala., was nominated for vice president.

The following were named for directors to serve 3 years: Marshall Post, retiring president A.F.A., and vice president, Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.; W. B. Coleman, president, W. B. Coleman Co., Philadelphia; C. R. Culling, vice president, Carondelet Foundry Co., St. Louis; Fred J. Walls, metallurgical engineer, International Nickel Co., Detroit; and Otto A. Pfaff, vice president, American Foundry Equipment Co., Mishawaka, Ind.

The nominating committee consisted of the following: Chairman, Past President Frank J. Lanahan, Fort Pitt Malleable Iron Co., Pittsburgh; Past President James L. Wick, Jr., Falcon Bronze Co., Youngstown, O.; Past President Hyman Bornstein, Deere & Co., Moline, Ill.; A. L. Boegehold, General Motors Research Laboratory, Detroit; L. H. Rudesill, Griffin Wheel Co., Chicago; Sam Tour, Lucius Pitkin Inc., New York; Walton L. Woody, National Malleable & Steel Casting Co., Sharon, Pa.

In accordance with the provisions of the by-laws of the association, additional nominations for any or all vacancies may be submitted through a petition filed with the association's secretary 30 days or more prior to the date of the business meeting held during the annual convention, and signed by 35 members in good standing. If no other candidates are nominated in that manner, the by-laws state that nominations shall be closed and the secretary shall cast a unanimous ballot for the election of the candidates named in the report of the nominating committee.

Malleable Iron Foundry*

SLASHES MIX COST

with TRULINE BINDER**

A large Eastern foundry has made these big discoveries:

1. Truline Binder saves on binder cost.

2. Truline Binder permits the use of black sand.

Here's how this malleable iron foundry saves:

1. Truline Binder replaces other higher-priced binders. **Saving No. 1.**

2. For every ton of sand used, only 500 lb. of new sand is needed. This means 75% of reclaimed sand in the mix. **Result: Another big saving.**

So it goes. In foundry after foundry, Truline Binder is cutting costs, producing better cores, and speeding up work. The advantages listed at the right will show how you, too, can save money by using Truline Binder.

*A typical example of the savings and improvements in foundry practice made possible by Truline Binder—another reason for the phenomenal growth of Truline Binder sales.

Advantages of TRULINE BINDER

- Low initial cost.
- Pulverized to a uniform fineness.
- Does not absorb moisture.
- Makes strong cores that will not warp.
- Makes permeable cores that burn out after metal is poured.
- Helps to eliminate cracks, especially in high-shrinkage castings.
- Helps to produce smooth, strong castings, thus reducing cleaning costs.
- Can be used wherever metals are cast.

**Reg. U. S. Pat. Off. by Hercules Powder Company

HERCULES NAVAL STORES

HERCULES POWDER COMPANY
Incorporated
999 Market Street, Wilmington, Delaware

CHICAGO NEW YORK ST. LOUIS
SALT LAKE CITY SAN FRANCISCO

JJ-21

Convention Program Will Cover Wide Range of Topics

CINCINNATI foundrymen, highly enthused that their city has been selected as host for the 1939 annual convention of the American Foundrymen's association, are proceeding energetically with arrangements to insure one of the most attractive meetings ever held. Interest and activity are shown clearly by the fact that during the past two months a Cincinnati chapter of the A.F.A. has been organized which has held two regular meetings.

Committee on organization, which has been directing all those activities included G. A. Seyler, Lunkenheimer Co., chairman; E. B. Hausfeld, Ohio Pattern Works & Foundry Co., secretary; J. W. Hamilton, Frigidaire division, General Motors Corp.; Bruce Hill, Hill & Griffith Co.; W. M. Ball, Edna Mfg. Co.; H. Heilig, Wm. Powell Co.; H. K. Ewig and Philip Cone, Cincinnati Milling Machine Co.; Earl Thompson, H. P. Deuscher Co., and E. T. Korten, Reliable Pattern & Castings Co.

Organize A.F.A. Chapter

First regular meeting of the group was held Jan. 30 at which a nominating committee to propose officers was appointed. It was comprised of Messrs. Cone, Hausfeld, Hill and Seyler. Principal speaker of the meeting was M. A. Scott, Greenlee Foundry Co., Chicago, who talked on production of uniform, dense structures in high test and alloy iron castings. Mr. Scott described investigations in his plant which led to the adoption of pouring castings through the riser on such castings as bushings, gear blanks, dies, rolls, and flywheels. According to the speaker that practice eliminated shrinks which evidently were caused by hot sand pockets formed between the regular gates and the casting.

Second regular meeting of the chapter was held Feb. 14 at the Alms hotel, Cincinnati, with George A. Seyler, presiding. Over 100 members and guests were present to hear H. W. Dietert, Harry W. Dietert Co., Detroit, discuss practical sand control in foundries. He listed 13 physical properties of sand in their order of importance as follows: Grain size, permeability, clay content and green strength, refractoriness, grain distribution, fines durability, dry strength, objectionable foreign matter, hot strength, deformation or plasticity, and grain shape.

Mr. Dietert discussed each of the properties in detail, and then described methods of evaluating them. He cited sand control data which have proved satisfactory for various types of castings, and presented information on causes of casting defects due to sand with methods of eliminating them. Much interest was created by the speaker's remarks, and a lively discussion of various points ensued.

Next regular meeting of the Cincinnati chapter will be held March 14 at which time election of officers will take place, and announcement will be made of the personnel of some of the local committees which will handle various details of the forty-third annual A.F.A. convention which will be held May 15 to 18. Special attention will be given to plant visitations, and while many of the important industrial plants will be open for inspection, the entire afternoon of May 15 will be devoted to a visit to the Cincinnati Milling Machine Co., one of the country's largest manufacturers of machine tools.

Outline Ambitious Program

Headquarters and registration will be at the Gibson hotel, and that hotel with the Netherlands Plaza will be occupied with many technical sessions, round table luncheons, and other meetings of the week. A program of some 35 sessions has been prepared to cover all branches of the foundry field as well as safety and hygiene, costs, refractories, materials handling, apprentices and foreman training, time study, sand research and patternmaking.

An innovation and feature of the convention will be a 4-session lecture course on, "Elementary Metallurgy and Use of the Microscope in the Foundry" which will be presented by R. M. Allen, Bloomfield, N. J. Two exchange papers from European foundry associations are being prepared. One on "Castings for the British Gas Industry," by F. Whitehouse, Newton, Chambers & Co. Ltd., Chapeltown, England, will be presented on behalf of the Institute of British Foundrymen while one on "A Discussion of Steel Castings Having High Mechanical Properties," by Georges Delbart, Societe de Constructions Mechanique, will be presented in behalf of the Association Technique de Fonderie de France.

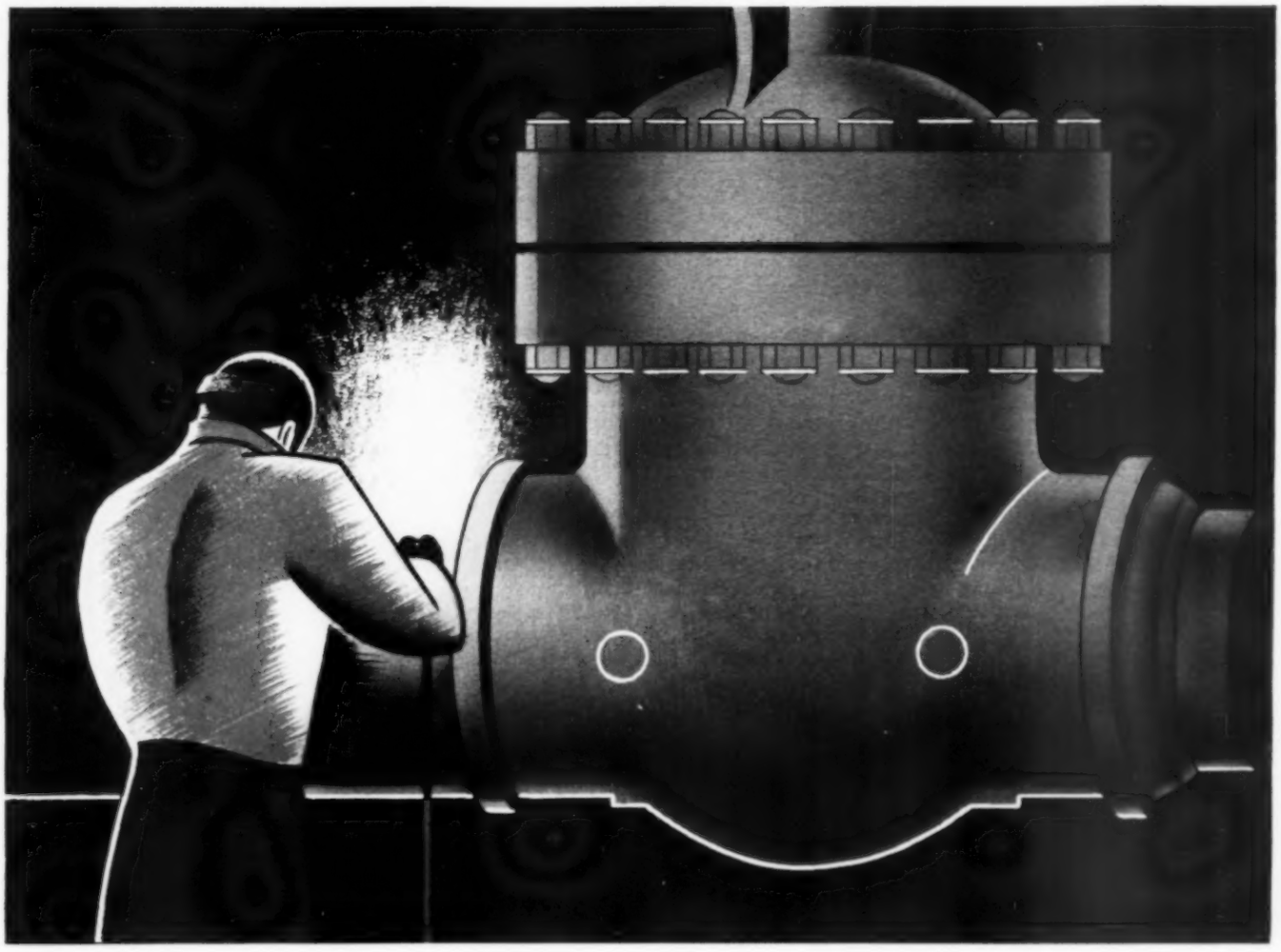
Three sessions on foreman and apprentice training are scheduled and they will include the following papers: "A Foundryman's Approach to Foreman Training," by W. G. Conner Jr., Walworth Co., Greensburg, Pa., "Apprentice Training," by A. R. Lubke, Fairbanks, Morse Co., Beloit, Wis., "Apprentice Training at Cincinnati Milling Machine Co.", by H. K. Ewig, Cincinnati Milling Machine Co., Cincinnati, and "Caterpillar Training Plan," by M. J. Gregory, Caterpillar Tractor Co., Peoria, Ill. A highlight of the convention will be an address by G. J. Stegemerten, time study and methods department, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., in which he will discuss a practical approach to motion and time study.

Hold Steel Melting Symposium

Castability of metals will be discussed in one session which will include papers on "Castability of Cast Steel," by C. H. Lorig, Battelle Memorial institute, Columbus, O., "Effects of Superheating on the Castability and Physical Properties of Gray Iron," by N. A. Ziegler and H. W. Northrup, Crane Co., Chicago, and "Measurement of the Fluidity of Aluminum Alloys," by L. W. Eastwood, Aluminum Co. of America, Cleveland. J. A. Kolb, Caterpillar Tractor Co., Peoria, Ill., will discuss and demonstrate pattermaking problems.

A steel melting symposium has been arranged which will include the following: "Basic Electric Steel Melting," by C. W. Briggs, Steel Founders' Society of America, Cleveland, "Acid Electric Melting," by W. G. Finster, Reading Steel Castings division, American Chain & Cable Co., Reading, Pa., and H. D. Phillips, Dodge Steel Co., Philadelphia, "Basic Open Hearth Practice," by J. W. Porter, American Steel Foundries, East Chicago, Ind., "Acid Open Hearth Practice," by W. C. Harris, Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa., "Modern Converter Practice," by

(*Concluded on page* 94)



IT'S 10 TO 1

. . . your vital problem right now is a better product at a competitive cost; and improved materials may be the answer. A recheck of your alloy steel specifications may well bring to light possibilities for added economy and efficiency through a broader use of Molybdenum steels.

Here's a concrete case. Several important manufacturers of steam generating equipment have adopted Carbon-Molybdenum steel for many different parts. They find that the higher creep strength of the steel makes possible higher operating temperatures and pressures. In addition, Carbon-Molybdenum steel is easily welded.

What is more, Carbon-Molybdenum steel not only meets the physical requirements, but comes within the cost limitations that always exist. We will gladly send our technical books, "Molybdenum in Steel" and "Molybdenum in Cast Iron", free to any engineer or production man interested in improved materials giving more per alloy dollar.

PRODUCERS OF FERRO-MOLYBDENUM, CALCIUM MOLYBDATE AND MOLYBDENUM TRIOXIDE

Climax Mo-lyb-den-um Company
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MOLY

Wisconsin Chapter Stages Regional Conference

A NEW high record was established Feb. 16 and 17 when approximately 600 foundrymen attended the second annual regional foundry conference in Milwaukee under the joint sponsorship of the Wisconsin Chapter A.F.A., and the department of mining and metallurgy, University of Wisconsin. This is about three times the number who attended the first conference a year ago and is distinctly complimentary to the highly efficient promotion committee under the joint chairmanship of Charles I. Wesley, Wesley Steel Treating Co., Milwaukee and Prof. E. R. Shorey, University of Wisconsin. The committee had the active support of the chapter officers, Roy M. Jacobs, Standard Brass Works, president; William J. MacNeill, Federal Malleable Corp., vice president; B. D. Claffey, General Malleable Corp., Waukesha, secretary and William J. Donnelly, Smith Steel Foundry Co., treasurer. Among the lay members who contributed freely their time and effort prominent place was taken by William F. Bornfleith, Cutler-Hammer Co., who served so admirably as general chairman of the committee which staged the A.F.A. convention and exhibition in Milwaukee in 1937.

Present Varied Program

An interesting program covering a wide range of subjects connected with the foundry industry was prepared by a committee including Ralph S. MacPherran, Allis-Chalmers Mfg. Co., in charge of the gray iron section; Edward Meyer, Chain Belt Co., and Prof. J. F. Oesterle, University of Wisconsin, in charge of malleable iron; David Zuege, Sivyer Steel Casting Co., in charge of steel; Oscar Frohman, Ampco Metal Co., and B. D. Claffey, General Malleable Corp., and Werra Aluminum Corp., in charge of the sessions on nonferrous metals.

Variation from the strictly technical sessions was presented at the opening meeting, luncheon meeting and dinner meeting Thursday, luncheon and closing meeting Friday by community singing and by serious and humorous comment on the part of prominent speakers. At the opening meeting Dean F. Ellis Johnson, University of Wisconsin, directed attention to the fact that although the art of founding metals is among the oldest practiced by man, real progress has been made only in the past 50 years, or since science really has taken hold. Science has invaded all sections of the industrial field and it is only fair to assume that future progress in the foundry will be even more phenomenal than in the past.

Under the title "Flirting with New Patterns," Lawrence W. Rogers, special lecturer, college of the City of New York, presented an inspiring address in which he claimed that men of initiative and spirit have more opportunities now than at any other period of this country's history. He quoted statements indicating that from the time of Benjamin Franklin, pessimists have been abroad in the land preaching the doctrine of defeatism. In each case the opinion was held that with the passing of the previous 10 years, all opportunity for pushing ahead had ceased. A calm review of history shows that progress never has ceased. Invention has kept pace with industry, has outstripped it in many instances and has opened vast new fields for exploitation. Each new gate has opened up wider and vaster fields.

The dinner meeting Thursday was enlivened by a cleverly planned humorous address by William Beard, and by a forceful practical address on present day problems by William Mass, executive secretary to Governor Heil of Wisconsin. At that meeting Chairman Roy Jacobs announced appointment of Eugene Silver, Smith Steel Casting Co. Edward Meyer, Chain Belt Co., and Charles I. Wesley, Wesley Steel Treating Co., as a nominating committee to select a slate of officers for the Wisconsin chapter for the coming year.

Discuss European Situation

The present international situation was discussed at the Friday noon luncheon meeting by Dr. Lee F. Lawrence, University of Wisconsin. At the closing meeting Friday, some of these statements were sharply challenged by Captain Raymondo Orsetti of the Italian diplomatic corps. What might easily have developed into a serious international complication happily was averted when the gallant captain discarded his Italian dialect and as the saying goes, kept his audience in stitches with examples of wit and humor tinged with a Boston (South) accent.

Program of technical sessions was scheduled carefully in advance and carried through on sharp time limits. An innovation, worthy of universal adoption, was the presence of a large clock in each room. A large card, changed as required, announced the subject under discussion, and the time limitation. By closely adhering to the plan, the entire program was handled readily and in perfect order. First session each day ran from 9 to 10:15; second from 10:20 to 12 noon. In the afternoon the first sessions opened at 1:30 and closed at 3:20. The final session each day ran from 3:30 to 5 p. m. With the exception of three joint meetings, all the other meetings to a total number of 20 were conducted four at a time simultaneously in individual rooms. The routine in each case was the same, one session devoted to gray iron, one to malleable, one to steel and one to nonferrous. In a few instances the second session was a continuation of the first, but in the majority of instances a fresh topic or several topics were discussed.

Set Rates of Pay

The first joint meeting already referred to served to get the program under way. The second 3:30 to 5 p. m., Thursday centered around two subjects "Job Evaluation," by Charles W. Pendrock, president Le Roi Co., and "Foundry Job Evaluation," by Edward L. Roth, president Motor Castings Co., Milwaukee. In the absence of William J. MacNeill, the chair at that session was taken by A. C. Ziebell, Universal Foundry Co., Oshkosh, Wis. Incidentally Bill, an ardent disciple o' the roar-r-r-in' game, was attending a bonspiel in Toronto. Nothing to do with the conference, but thought you would like to know!

The first speaker claimed that in view of changed conditions it behooves the modern manager to adopt a new technique in the evaluation of jobs and to the setting of rates of pay. In development of that theme he detailed a wide list of factors to be considered including education, knowledge, experience, initiative, ability, physical demand, mental equipment, responsi-

(*Continued on page* 46)

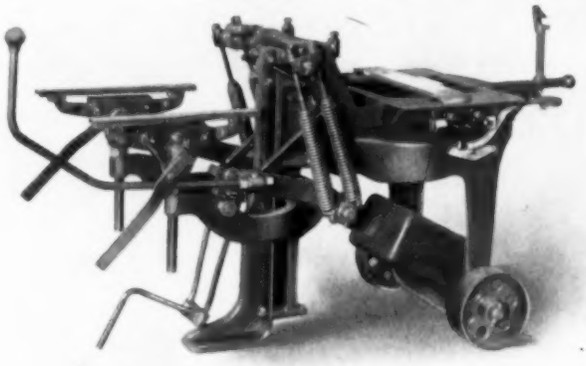
CUT CORE COSTS

WITH OSBORN ROLLOVER CORE MACHINES

FOR SMALL CORES

No. 40—WITH HAND OPERATED JOLT
No. 140—WITH AIR OPERATED JOLT

FOR MEDIUM CORES



No. 42—WITH HAND OPERATED JOLT
No. 142—WITH AIR OPERATED JOLT

• These machines improve quality and lower costs on certain cores which, due to type and quantity required, are not suited for production on core blowing machines.

Wide cores, long cores, deep cores, with or without loose pieces, are made on these machines with minimum effort and maximum speed, thereby providing a wide range of applications.

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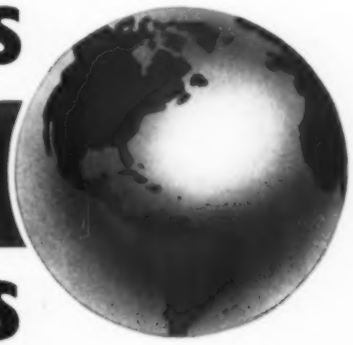


MOULDING MACHINES

(*Continued from page* 44)

bility, working conditions and hazards of occupation.

The second speaker presented a table showing the 15 factors on which job valuation is based: Time required to learn a trade, time to adapt to conditions, scarcity of labor, difficulty in getting another job, educational requirements, prevailing rates of pay, accuracy and skill required, ingenuity, manufacturing hazard, honesty of effect, dirtiness in working conditions, health hazard, accident hazard, physical effort, monotony. A definite percentage is allotted to each factor and the total in each case made up accordingly. The paper showed in complete detail how the system is applied. The formula is so clear in the breakdown, he claimed, that his company was able to clear up all questions arising in worker's minds by going over the analysis sheets with them.

Prices Depend on Costs

In the speaker's opinion the best method of obtaining the correct number of skill points is actually to have some of the workmen discuss the various factors with their foremen and superintendent and fix a final figure for each factor which will add up to a fair and impartial total. He claimed that casting prices must follow labor costs. If they are too high, the entire industry suffers. Customers look for substitutes. If they are too low in enough cases the entire industry suffers from lack of a fair return for goods and service.

Coke from many angles was discussed by Charles L. Waggoner, plant manager, Chicago plant Interlake Iron Corp., Chicago at the first gray iron session. This and succeeding gray iron sessions were presided over by Ralph S. MacPherran, Allis-Chalmers Mfg. Co., Milwaukee. The speakers stated that while coke is an important factor in cupola operation, the relative cost in proportion to the cost of other factors is so low that no excuse exists for skimping either in price or quantity. An approximate breakdown of the factors involved show that labor costs 73 per cent, iron costs 24 per cent and coke only 3 per cent.

The second gray iron session was devoted to cupola practice, particularly the operation of a cupola on long heats as described by John Lowe, consultant, Lansing, Mich. A number of slides were presented to show various features in the construction and operation of a water cooled cupola in which the bottom is dropped only at week ends. Water is circulated through a water jacket which surrounds the cupola in the melting zone area above the tuyeres. The speaker admitted that the arrangement might not appeal to the average jobbing foundryman operating a cupola for 1 or 2 hours per heat, but it had proved decidedly advantageous in the installation under discussion. The cupola was in operation 18 hours per day, then was drained and allowed to stand for 6 hours when a new bed was adjusted, charges placed and melting was resumed.

Other subjects included in the succeeding sessions on gray iron were heat treating by James S. Vanick, International Nickel Co., and gating and rising by Martin J. Leffler, works manager Western Foundry Co., Chicago. The speaker claimed that the foundry foreman

Charles I. Wesley
Wesley Steel Treating Co., Milwaukee, and joint chairman of conference

usually is better qualified than any other person in deciding on the position, size and shape of gates. In the development of standards the following factors should be considered: Fill cavity before metal freezes, disturb mold cavity as little as possible, keep out slag and dirt, runners and gates as small as possible, provide reservoir of molten metal, favor brass gates screwed to plate, material, shape and position of skim cores, check pouring time.

At the Friday afternoon session W. A. Hambley, Allis-Chalmers Mfg. Co., discussed the following 37 reasons for scrap castings: Missrun, shot iron, shrinks, coldshut, runout, cracks, broken castings, hard spots, warpage, porosity, blows, dirt, slag, scabs, strains, swells, shifts, drops, pin holes, penetration, crush, pour short, buckles, cuts and washes, oxidized iron, core and mold penetration, core cut through, core raise, broken core, internal chill, no core, wrong metal.

"Heat Treatment of Cast Iron" was discussed by Stanley P. Rockwell, Stanley P. Rockwell Co., Hartford, Conn. A series of charts illustrated the potential possibilities of the metal in this field.

Problems, applications and production of gray iron castings afforded M. J. Gregory, Caterpillar Tractor Co., Peoria, Ill., an opportunity to show how the modern gray iron foundry is meeting present day problems. Through a series of slides he conducted his audience, in this instance a joint meeting, through his foundry where castings are made in weights from a few ounces to 2 tons. A base iron is manipulated to meet the varying conditions. Close control, mechanical equipment and utilization of low cost scrap are important factors in economical production of castings. The speaker employed a number of castings to illustrate his reference to certain features. Sleeve linings for diesel engines are cast horizontally following long experimental trials with vertical and inclined pouring and with the centrifugal method. He discussed heat treatment, use of chills, cores, gating systems, metal composition and other phases of the subject in a thoroughly practical and highly informative manner. The collection of castings and cores was turned over to the engineering college of the University of Wisconsin at the conclusion of the conference.

Production of Malleable Iron

At the first malleable iron session P. C. DeBruyne Moline Malleable Iron Co., St. Charles, Ill., presented a paper on the methods and materials employed in producing malleable iron in the conventional type air furnace fired with powdered coal. The morning heat is made up of 45 per cent sprue, 10 per cent malleable scrap and 45 per cent pig iron. Charge for the afternoon heat contains 45 per cent sprue, 12 per cent malleable scrap, 3 per cent steel and 40 per cent pig iron. The speaker claimed that malleable iron scrap is open to objection when used in large amount. Serious error may appear in the final analysis. Rust, in some instances amounting to 4 per cent, is a total loss. Also this forms an oxidizing slag and has great effect on the silicon and carbon. Coal consumption is approximately 700 pounds per ton. In the morning heat the metal is melted at the rate of 20 minutes per ton for a 15 ton heat and at the rate of 17 minutes per ton for a similar heat in the afternoon. Iron is taken from the furnace at the rate of approximately 2 minutes per ton. A supplement to the paper showed the analysis of railroad malleable scrap, steel angle bars, steel rails, tie plates, high volatile coal, low volatile coal, pocohontas coal, and furnace slag.

At the subsequent malleable iron

(*Concluded on page* 49)

ADVERTISING PAGES REMOVED

(*Concluded from page* 46)

sessions new developments in annealing were discussed by D. I. Dobson, General Malleable Corp., Waukesha, Wis., while two sessions were devoted to a general scrap clinic. A wide variety of scrap castings provoked an animated discussion on the causes and remedies. The final malleable iron session was devoted to a discussion of sand under the leadership of Bert Stone, Belle City Malleable Iron Co., Racine, Wis. Comparison was made between natural and synthetic sand in ramming properties, flowability, permeability life and effect on the skin of the casting. Consensus of opinion favored a moisture content of 5 to 6 per cent and a permeability of 20 to 60. It was pointed out that both the permeability and moisture content were affected to a marked degree by the amount of clay in the sand.

Consider Steel Castings

Four sessions under the chairmanship of David Zuege, Sivyer Steel Castings Co., Milwaukee were devoted to a discussion of steel foundry practice. The first on melting practice was conducted by James C. Sweitzer, Sivyer Steel Casting Co., and dealt mainly with detailed operation of the acid electric furnace. Discussion centered mainly on the effect of dissolved gas in the formation of pin, gas and blowholes in the castings. In many instances the metal is blamed for defects properly attributable to molds or cores. This feature was developed to a further extent at a second session where D. L. Parker, General Electric Co., Lynn, Mass., discussed sand in its various aspects and effects in the steel foundry.

At the third session James Murray, Hubbard division, Continental Roll & Steel Foundry Co., East Chicago, Ind., presented a series of slides showing many large steel castings. These formed a base for his discussion on the subject of core room materials and practices. A core wash made up of silica flour, bentonite and oil has proved highly efficacious on cores exposed to high heat and pressure.

K. V. Wheeler, Lebanon Steel Foundry, Lebanon, Pa., discussed steel foundry practice in general with particular reference to the importance of design in the casting. An extensive series of slides illustrated proper and improper design features in the pattern supplemented by other slides showing similar features in the application of gates and risers.

Problems affecting the nonferrous foundryman were discussed extentively at five session under the chairmanship of Oscar Frohman, Ampco Metal Co., Milwaukee. The first session conducted by W. E. Sicha, Aluminum Co. of America, Cleveland, began with a discussion of aluminum alloys and gradually developed into a general discussion on practically every phase of aluminum foundry practice.

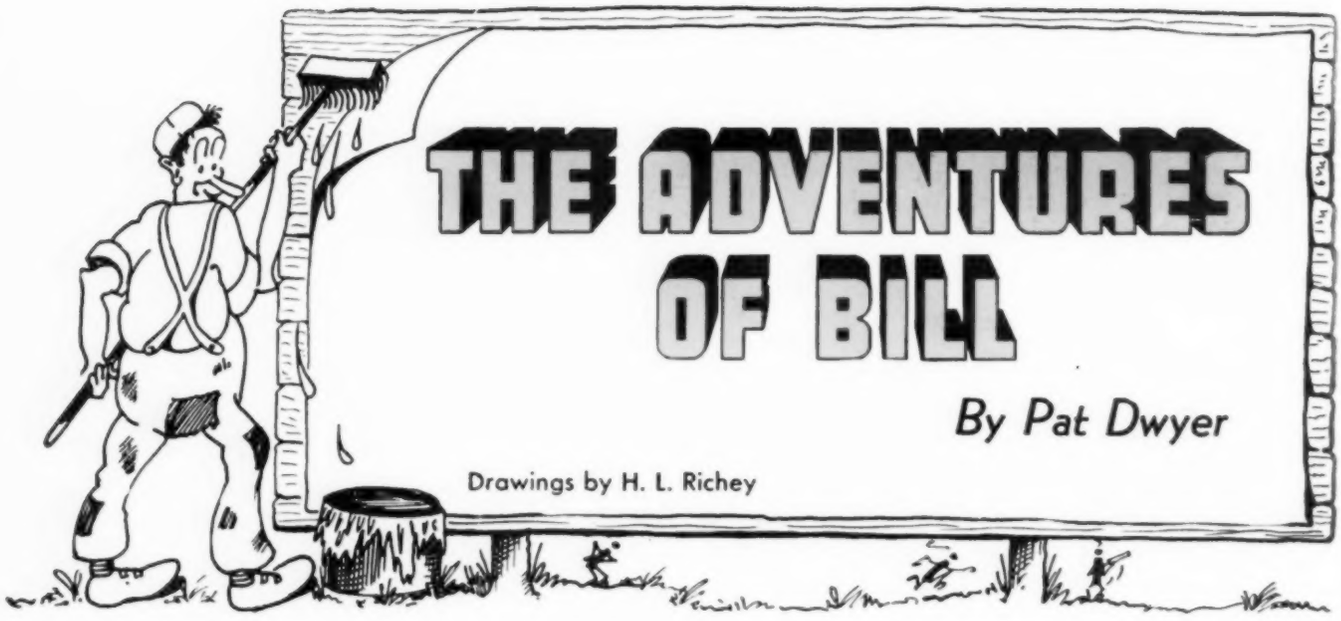
Discussing secondary aluminum and its alloys at the second session, R. D. T. Hollowell, secretary manager, Aluminum Research institute, Chicago stated that today secondary aluminum manufactured by a responsible smelter who maintains complete laboratory service, can be used satisfactorily for almost any purpose where primary metal is employed regularly. This does not mean that secondary metal irrespective of composition and quality can be substituted for good grades of primary metal. It does mean that secondary metal of the required composition properly made and refined is metallurgically equivalent to primary aluminum. C. O. Thieme, H. Kramer & Co., Chicago, led the discussion at the third nonferrous session dealing with manganese bronze and nickel silver. As with other metals he directed attention to the fact that many castings are scrapped on account of the molding and coremaking practice and not on account of the metal or the melting practice. Usual deoxidizers include phosphor copper and manganese copper, but for nickel silver the speaker's personal preference is for a small amount of magnesium, ½ ounce per 100 pounds of metal. Calcium boride and barium are used as fluxes for monel metal while a covering of glass is advantageous in many instances.

The final session conducted by Eugene W. Smith Jr., Eugene W. Smith, Inc., Evansville, Ind., considered many phases of the practically limitless subject of sand. A number of scrap castings submitted for examination precipitated a lively discussion.

Carnegie Library of Pittsburgh, Pittsburgh, recently has published a booklet entitled, "Review of Iron and Steel Literature for 1938," by E. H. McClelland which presents a classified list of the more important books, serials, and trade publications issued during the past year.

Simplify Work with an Air Wrench

WHERE large castings are made in steel and iron foundries the preliminary work involves the building of heavy flasks from plates and flanged sections. Frequently the necessity arises of rebuilding flasks to other sizes. Sections are held together with bolts and nuts. Cope flasks are provided with transverse bars. In some instances chuck bars and other pieces of equipment are required in the drags or other parts of the flask. All these parts are held in place with bolts and nuts. Obviously this phase of foundry activity consumes a considerable amount of time. The time is cut down to a material extent, it is claimed, by the use of pneumatically operated wrench produced by the Ingersoll-Rand Co., 11 Broadway, New York, and shown in the accompanying illustration. Power for the wrench is supplied by a mutivane air motor. The torque is converted into rotary impacts which are transmitted to a chuck or socket which engages the nut. These impacts take place at the rate of from 1100 to 1700 per minute, depending on the size of the tool and exert a powerful turning effect.



THE ADVENTURES OF BILL

By Pat Dwyer

Drawings by H. L. Richey

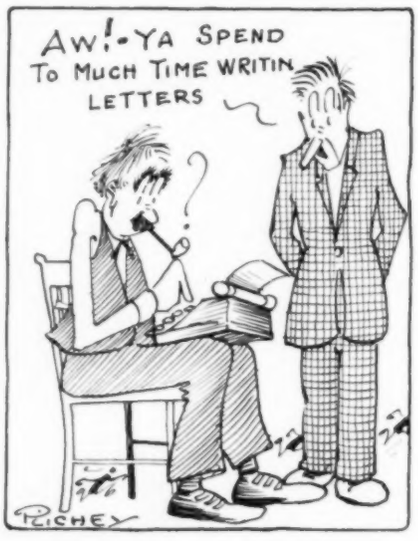
THE other night Bill came in while I was busily engaged in writing a letter to a friend with whom I occasionally correspond. Perhaps the statement that I was busily engaged is slightly exaggerated. I had set down my address, the day of the month and year and even had achieved the opening salutation Dear Joe. At this point the well spring of inspiration—flowing, mind you, like a blinkin' alpine torrent — suddenly went absolutely dry.

If the more or less dear Joe was present I am reasonably certain I could have talked to him on 40 different subjects of mutual interest. Without him I was stymied. If the performance would have saved my immortal soul from perdition, I could not think of a suitable opening sentence for the letter. From occasional remarks picked up here and there by a pair of generous ears I have gathered the general impression in the course of a long and I trust not entirely misspent life, that other people are afflicted in a similar manner.

Appeal to Bill for help, succor, assistance, aid and—er—all that kind of stuff fell upon stony ground. If the trouble and exertion of walking across the room were not too great I might dig a few more synonyms out of Mr. Roget's *Thesaurus*, but I feel reasonably certain that you get the general idea. I was in deep water going down for the third time. My mind was as blank as the virgin sheet of paper in the little typewriter resting on my knees and I was ready, nay more than ready, I was dying to make a grab at the proverbial straw. What I really needed was a life line, good stout manilla any size from ½-inch upward. Hard hearted Bill continued to smoke placidly. He made not the slightest effort to heave either a straw or a life line in my direction.

"People waste altogether too much time writing letters." He waved his pipe stem in languid dismissal of the subject. "The majority of letters are not necessary. In many cases the writer and the bird who gets it would be better off if certain letters never were written. I knew a fella one time—."

"Never mind the fella you knew one time. Probably some illiterate character with his own on-again, off-again system of spelling, like a railroad time table, subject to change without notice. I knew an old Lunenburg skipper trading to the West Indies—fish one way and salt the other way — who whiled away some of the long peaceful watches on the gulf stream by attempting to teach some members of the crew navigation. After a lecture he had them write the answers on a slate. Instead of grading the answers on a percentage basis, he arbitrarily marked them up as either *rite* or *rong!*"



Ain't it the solemn truth dearie?

"Well," said Bill, "I'll tell you. What's the difference? The tarry students knew what he meant. That is more than you can say for certain messages written by very, very important people, stuffed with knowledge, honed you might say to an educational feather edge. Every word is spelled correctly. Every punctuation mark down to the lowly comma is in the appointed place, and yet so far as the average man is concerned he might just as well attempt to worm the meaning out of a mess of Sanscrit, a Babylonian brick or them there what do you call 'em things, hire-o, or high-ho lipsticks daubed on the mummies and rhinonosserosses and hence as the feller says, the pyramids of Egypt.

"Look at the highest tribunal in the land, the United States supreme court. If any person could extract the real meaning from the written word, you would think these eminent boys in the long black robes would be the ones to do it. You have not fingers enough on both hands to count the number of times this learned body has split into two groups on the interpretation and application of the law. Take for instance—."

"Take a turn or two on the winch," I said, "and shorten your cable. You are drifting away from the anchorage. What do I care for the doings of the supreme court? The distinguished members never heard of

(*Continued on page* 52)

Uniform

The problem of attaining *uniform* and accurate castings can be readily simplified by employing the strength of Sterling Flasks.

Sterling strength and rigidity will check distortion of any kind, resist jolts, prevent run-outs or swelled castings—the result—a *uniform* quality product.

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(*Continued from page* 50)

you or of me. So far as they are concerned we do not exist. To kind of even things up I ignore them completely, their activities and all their works and pomps.

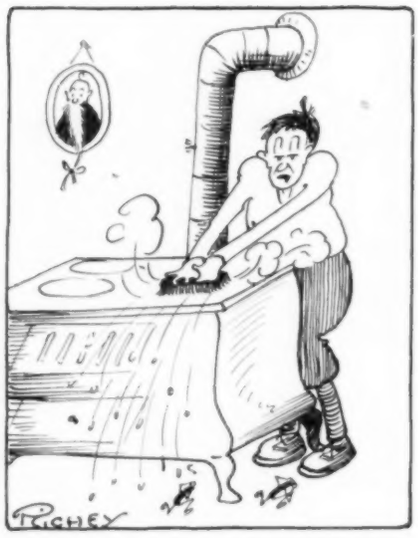
"Anyway, I have troubles enough of my own. Here I am faced with the necessity of writing a letter and you withhold the good old helping hand. Do you call that the true fraternal spirit, let no day pass without rendering a kindness to a brother and all that kind of thing?

"I offered you the good old helping hand," Bill patiently explained, "but instead of grasping it you went off in a smelly Lunenburg schooner for a trip to the West Indies. I never have any trouble writing letters. Do you know why I never have any trouble writing letters? Because I don't write 'em, that's why. If an emergency of any kind turns up I telegraph or telephone. Once or twice a year I buy a bunch of post cards and send one to each of a widely scattered list of family relatives and a few other people who possibly may be interested mildly in the fact that I am still one hop ahead of the old boy, the bailif and the old clothes man. I place the address on one side of the card and the two simple letters O. K. on the other side and every one is satisfied. The essence of simplicity and efficiency my dear boy. I pass the idea along to you free gratis for nothing."

"The idea has merit," I admitted, "and I am inclined to adopt it in the present instance. However, every now and again I find myself up against a situation where your post card technique would be worse than useless."

"Never failed me. Of course I am just a plain, honest citizen—Worthy William I was known as back home—."

"Did you say worthy or wordy?"



Does he love the work? Well, No!

"What do you mean, wordy? The curse iv Crummle," he exclaimed piously, "on the man who has not sense enough to accept a bit of friendly advice. Instead of sitting there like a brooding hen, vainly trying to hatch enough anemic tripe to cover a page, perhaps you could come out of your trance long enough to tell me of a single instance in which my short cut letter writing method could not be applied. Just one. That is all I ask."

"I could tell you of 47, but here is one that will hold you for a while. To set up a barrier against possible litigation, reprisals, malfeasance, torts and other foxy dodges of the legal profession I shall use fictitious names."

"I get you. Duces Tecum, Sub Poena, Habeas Corpus, Flagranti Delicto, Hopper Topper, Bottle Legs and Salt Bags. Carry on, James!"

"An old friend of mine in a foreign country wrote me that in a tour of America some time ago he had visited the plant of the Prairie Belle Stove & Range Co., in a certain city. There he had witnessed a special method for treating the castings by heating them and dipping them in oil. At the time he was not particularly interested and had not inquired closely into the details of the process. Recently his firm had occasion to conduct some experiments with corrosion resistant processes. He would greatly appreciate any information I could give him on the method practiced by the Prairie Belle people.

"To increase what meager knowledge I had on the subject I got in touch with a prominent stove man and put the proposition before him. He said that he had heard of the process, but was not familiar with the details.

" 'Tell you what to do,' says he. 'Write to the Prairie Belle Stove & Range Co. They do that kind of work in their plant. Address your letter to Mr. W. G. Rausmitem. Bill is a good old scout and I am sure he will tell you all about it.'

"I wrote to Mr. Rausmitem and waited for a week like the fellow in the old time song for 'The Letter That Never Came.'

"I wrote a duplicate letter to the editor of a publication representing the stove making industry. Here, said I to myself, is a sure shot. Editors know everything."

"Sez you," Bill interrupted rudely. "God help all poor sailors on a night like this. I know what he told you. He told you to write to the Prairie Belle Stove & Range Co."

"Marvellous, my dear Watson! How do you do it? Must have been born with a caul or whatever it is that confers second sight on the wearer.

"Then I had a real hunch. I wrote to one of the boys of the old brigade, superintendent for many years of a prominent stove foundry. Our acquaintance dates back to a molder's convention in Toronto in 1902. We were there for a month—."

"You need not tell me," said Bill. "I was there with Johnny Rentschler and a bunch of the boys from 218. Remember old Alex Faulkener? About as tall as a hand rammer, chin pulled down as the result of a terrible burn in the Globe shipyard, but with the fierce little eyes, the heart and spirit of a fighting cock. He made a rousing speech one day—."

"I know," I said. "I know. They all made rousing speeches, but in the words of a famous old ballad, 'Their day is gone by and they now are no more, and the green grass is growing o'er Phadraig Crahore.' Martin Fox, Joe Valentine, Mike Keough and dozens of other stout lads have poured their last heat, dropped the

(*Concluded on page* 75)

All he needs is one more R to complete the treatise on navigation

. . . *this MAN*

with a wealth of ideas and a background of invaluable experience is backed by an organization specializing in machinery designed to produce molds of the highest quality at lowest cost. His services are offered to responsible foundrymen everywhere who are interested in revising their methods of production to compete with current high-speed deliveries and low prices. Why not call him in now? He will gladly give your molding problems a thorough analysis, without obligation to you, of course. Herman Pneumatic Mach. Co., Union Bank Bldg., Pittsburgh, Pa.

M O L D I N G M A C H I N E S

VIEWING Foundry Developments AT SHORT RANGE

CAREFUL consideration of nonferrous foundry problems leads to the opinion that more trouble is caused by improper melting than by many others combined. Molten metals greedily absorb reducing gases, and the higher the temperature and the longer the exposure, the more gases the metal will hold in suspension. If cooled slowly enough practically all of the gases will be ejected, but in the foundry the rapidly formed skin resulting from chilling the metal against the mold wall prevents escape of much of the gas—leaving numerous pinholes just under the surface. Hence, elimination of the trouble consists in obtaining complete combustion of the fuel, maintaining temperatures at the minimum above the pouring temperature, and removing the metal from the furnace as soon as possible.

* * *

Boon to melters in ferrous and nonferrous fields is claimed to be the development of a standardized ground and polished cobalt blue glass. It is available in eight standard shades, and is said to materially reduce eye strain.

* * *

According to one producer of malleable cast iron by the duplexing system, the melt must be over 30 tons per day to obtain a saving. On tonnage less than that, the cost is increased principally by labor.

* * *

A mixture of calcium carbide and sodium shows promise as a desulphurizer of pig iron, according to investigations being carried on by the bureau of mines. Best results have been obtained by permitting reactions between flux and metal to occur below the surface of the molten metal. Amount used ranges from 10 to 15 pounds per ton of metal. Methods of application include placing briqueted flux in graphite holder which is held beneath surface, and ramming flux in bottom of ladle where due to its high melting point, the flux would be released slowly upon addition of hot metal.

* * *

IN ENGLAND a portable instrument has been developed to measure the thickness of metal walls from one side only. It employs direct current from a storage battery, and operates on the resistance principle. While designed for determining thickness of steel tubes, it gives accurate measurements on steel plates up to 1½-inch thick, and cast iron up to 3 inches thick. One application on motor cylinder blocks indicated shift of the barrel core, and another showed presence of cavities in a heavy gray iron casting which was confirmed by breaking up the casting.

* * *

High-temperature, nonshrinking, plastic refractory is claimed to be an excellent material for burner arches on pulverized coal-fired air furnaces, dutch ovens in annealing furnaces, and for lining ladles. When using the plastic refractory, ram well using small pieces of the material as removed from the container. A lining 1¾ inches thick is suitable for ladles from 500 to 1000 pounds capacity.

* * *

Fuel consumption for an 8-ton capacity, rotary, powdered coal-fired furnace varies from 400 to 500 pounds per ton of iron melted, depending on operating conditions. Refractory cost, using acid refractories, varies from 30 to 70 cents per ton of iron melted including labor and fuel for week-end heating. Power costs with current at 1½ cents per kilowatt-hour, run from 15 to 25 cents per ton of iron melted including power for pulverizing coal.

* * *

Use of bonding material in laying up bungs for malleable air furnaces is said to be beneficial where the bungs receive rough treatment. Best material is claimed to be an air-setting, high temperature cement. Amount and consistency of cement will depend upon the straightness of the brick. Also bungs built of 9 and 13½-inch brick in alternate rows, that is—two 13½ and then three 9-inch brick—last 30 to 40 per cent longer than bungs built entirely of 13½-inch brick.

* * *

SEVERAL methods are available for reducing as much as possible the zinc fumes given off in yellow brasses during pouring. One to four ounces of aluminum per 100 pounds of brass gives good results, but it cannot be employed if the castings must withstand pressure. Melting under glass which forms a tight covering slag also helps. In pouring just make a hole in the slag at the crucible lip, leaving the remainder of the cover intact.

* * *

One middlewestern malleable foundry indicates that its pot ring cost is $2.22 per ton of iron annealed, and the average pot life is 25 heats. With hand fired annealing ovens and coal at $4.08 per ton, the coal cost per ton of castings annealed is $2.24 while with powdered coal firing, and coal at $3.58 per ton, the coal cost per ton of castings is $1.074.

ADVERTISING PAGES REMOVED

New England

APPROXIMATELY 70 members and guests attended the regular monthly meeting of the New England Foundrymen's association, Feb. 8 to hear R. K. Glass, metallurgical department Republic Steel Corp. discuss "Defective Castings—Their Causes and Remedies."

Following the dinner and social hour Robert J. Nelson, Arcade Malleable Iron Co., Worcester, Mass., and president of the association introduced Mr. Glass whose talk was divided into three classifications as follows: Destroyed castings, defects such as scab, buckle, etc.; minor defects, such as misruns, shifts, burned in sand, etc.; wrong metal structure, weak, etc. Mr. Glass dealt with an analysis of the causes and remedies of the various defects.

Best education in foundry practice is to know how to produce a defect and it is equally essential to know what to do to eliminate it. Throughout the talk he urged closer co-operation between foundry and designing engineer and pointed out that control was a vital factor at all times. Mr. Glass concluded by showing many slides to illustrate proper and improper design as well as physical defects, microstructure and remedies for various defective castings. At the conclusion of the talk a question period followed in which many of those present participated.—*M. A. Hosmer.*

Wisconsin

REGULAR meeting of the Wisconsin chapter of A.F.A. was held at Schroeder hotel, Milwaukee, Jan. 20. Ninety members and guests attended. Roy M. Jacobs, Standard Brass Works, Milwaukee and chairman, presided at the meeting at which William F. Asche, chairman department of commerce, Wisconsin spoke. Mr. Asche heads a new nonpolitical department of the state established for the purpose of uniting state government and business in a program to develop industries and business of Wisconsin, also to consider and promote plans for legislation to be of benefit to business and labor.

Co-chairmen Charles Wesley and Professor Shorey of the conference committee were present and reported on arrangements for the annual conference.—*B. D. Claffey, secretary.*

New York-New Jersey

THEORIES relating to absorption of gases in metals were summarized by C. O. Thieme, chief metallurgist, H. Kramer & Co., Chicago, at the regular monthly meeting of the Metropolitan New York-New Jersey chapter of the A.F.A. at the Essex House, Newark, N. J., Feb. 6. Approximately 50 were present, with Don J. Reese, International Nickel Co., as chairman.

Mr. Thieme pointed out that there was no relationship between the quantity of gas absorbed by an alloy and its component metals. Gases simply may be absorbed mechanically, or may be in liquid or solid solution and may be present as a chemical compound, uniting with one or more of the elements of the alloy. He condemned the practice of preheating gates and sprues in the exhaust gases of a furnace to speed up melting. The speaker favored oxidizing atmospheres for melting and gave reasons, but stated that reducing atmospheres are not always detrimental in melting and that

(*Continued on page* 60)

Charles C. Kawin
Chas. C. Kawin Co., Chicago, and Treasurer, Chicago chapter

J. W. Kelin
American Smelting & Refining Corp., St. Louis, and Secretary-Treasurer of St. Louis chapter

John H. Tressler
Hickman, Williams & Co., Cleveland, and Secretary of the Northeastern Ohio chapter

H. C. Cummings
Reading, Pa., and Secretary of the Reading Foundrymen's association

Cincinnati

It's "on to the Queen City" . . . all aboard for the 43rd Annual Convention of the American Foundrymen's Association . . . May 15, 16, 17, 18 . . . Cincinnati, here we come!

Widely known for its City Managership form of government, its Universities, medicine and music, its picturesque location along the banks of the Ohio, Cincinnati is within a day or a night's travel from most important foundry centers.

Hundreds of foundrymen have reason to be attracted to the Convention this year offering, as it will, an outstanding program of plant visitations, meetings and technical sessions covering all phases of foundry management and production.

If you were an up-and-coming foundryman thirty years ago, you were probably among the 2000 who attended the last convention held in Cincinnati in 1909. Only a few veterans will probably remember the first meeting of 200 foundrymen there in 1898 . . . but it's Cincinnati again, and here we come!

A-F-A

43rd ANNUAL

CONVENTION

CINCINNATI . . . MAY 15 - 18, 1939

THE FOUNDRY will present the complete story!

As it has for many decades, THE FOUNDRY will devote the issues which precede and follow the foundry convention to an interesting, informative preview of the meetings and a comprehensive report on the convention itself . . . this year, the MAY Pre-Convention issue (in the mails May 2) and the JUNE Post-Convention issue (mailed June 6).

MAY Pre-Convention Issue

Placed in the hands of readers ten days prior to the convention, this issue will carry a complete, comprehensive preview of the occasion . . . the program of meetings, technical sessions and plant visitations . . . outline of social functions . . . Cincinnati as a foundry center . . . places to see . . . things to do . . . all in addition to the features of a regular issue of THE FOUNDRY.

To the foundry supplier, this issue offers unusual advertising value because it affords a timely opportunity to capitalize on the added reader-interest in equipment and supply considerations which prevail at convention-time and because the indications are that the foundry business HAS started to hit its stride, will enjoy increased demand during the months preceding and following the 1939 meetings. Forms close April 15.

JUNE Post-Convention Issue

A detailed story of the convention, comprising reports of technical papers, discussions, news of what happened, who was there, what was done, the story of plants inspected . . . in short, an accurate, printed record of the 1939 meetings plus all the features of a regular issue will combine to make the JUNE Post-Convention issue of unusual interest to readers of THE FOUNDRY throughout the world.

For those who go to Cincinnati, this issue will serve as a permanent record of convention-week. It will be the convention itself for those foundrymen unable to be present . . . guaranteeing to the advertiser an interested, receptive reader-audience. Orders released by innumerable foundries throughout the summer and fall may be materially influenced through advertising in this issue. Advertising forms close on May 20.

THE FOUNDRY • PENTON BUILDING • CLEVELAND

..COME...LEARN...PROFIT

Some of the committee members who arranged Southern California's Hi-Jinx party

sound castings may be produced. Gas porosity, change in shrinkage characteristics and sweating were traced to the presence of reducing gas.

Mr. Thieme touched briefly on vacuum melting and its practical application and on deoxider for red brass and bronze. He also outlined his opinion of good melting and pouring practice. He emphasized the importance of pyrometer control and stated that it was quite an impossibility to offer definite pouring temperature for any given alloy, as the design and size of the casting, the method of gating, and conditions of melting and deoxidation influenced the casting temperature. At best, a range of temperature only can be offered, he declared.—*B. K. Price.*

Southern California

SECOND annual Christmas Hi-Jinx of the Southern California chapter of A.F.A. was held at Rio Hondo Country club, Dec. 16, 1938. Three hundred and fifty foundrymen and guests were entertained in the usual sumptuous style which made this one of the outstanding social meetings of the year. A varied program of entertainment enlivened the party following dinner. Much credit for this highly successful affair is due W. F. Haggman, Foundry Specialties Co., chairman of the Entertainment committee. Other members of the committee are: J. G. Eberhart, Kay Brunner Steel Products; W. D. Bailey Jr., Pacific Metals Co.; S. Moseny, Independent Foundry Supply Co.; D. C. Murray, H. C. Donaldson Co.; Richard S. Smith, Cook Heat Treating Corp.; S. S. Brown, H. L. E. Meyer Jr. & Co.

More than 90 members and guests attended the regular meeting of the Southern California chapter held at the Clark hotel, Los Angeles, on Jan. 26. J. G. Coffman, chairman presided, and called upon F. C. Emory, Air Reduction Sales Co., who gave a demonstration of contraction and expansion of metals through the medium of liquid air as the cooling medium. Guest speaker was R. F. Lincoln, Osborn Mfg. Co., Cleveland, and treasurer of the Northeastern Ohio chapter. Mr. Lincoln extended greetings from the national headquarters and officers, and also from his chapter. He presented an interesting illustrated talk on application of molding machines to modern foundry problems.

Technical address of the meeting was given by John E. Wilson, Climax Molybdenum Co., on application and effect of molybdenum additions to gray cast iron. He pointed out that molybdenum is used alone and in combination with chromium, nickel, copper and vanadium to improve the physical properties. He said that late additions of silicon were effective in modifying dendritic graphite distribution, and improving tensile and transverse properties. Molybdenum improves high temperature strength properties of ferrite, and is a carbide forming element. It is being used in grate bars, lead and aluminum melting pots, enameling racks, brake drums, etc. Analyses will vary according to the service required, and in cast iron, copper ingot molds, and grinding ball chills, a marked improvement in service life was secured by addition of 0.80 to 1.0 per cent molybdenum to a base iron containing 3.50 to 3.75 per cent carbon, 0.80 to 1.0 per cent manganese and 1.20 to 1.60 per cent silicon. Addition of 0.50 to 1.0 per cent molybdenum and 0.50 to 3.0 per cent chromium to a base iron used for grate bars, enameling racks, etc. has improved service life materially.

He mentioned that it was interesting to note that foundrymen have reported improvements in toughness of white iron may be effected by use of 0.35 to 0.50 per cent molybdenum. From data reported, it may be concluded that additions of 0.50 to 1.0 per cent molybdenum, alone or in conjunction with 0.80 to 1.20 per cent manganese and 0.80 to 1.20 per cent chromium will improve wearing properties of white iron. Higher quantities of molybdenum from 4 to 5 per cent in conjunction with up to 3.0 per cent chromium offer marked improvement in wearing properties of white iron used for deep well pump liners, classifier shoes, pug mill knives, and sand slinger blades. Molybdenum, due to its ability to improve wearing properties, elevated temperature properties and toughness, is used extensively by chilled iron roll producers. Amount of molybdenum used will depend upon service conditions, and varies between 0.35 and 2.0 per cent.—*M. S. Robb, secretary.*

EDITOR'S NOTE: Photographs taken at the party are reproduced on pages 60 and 62 of this issue.

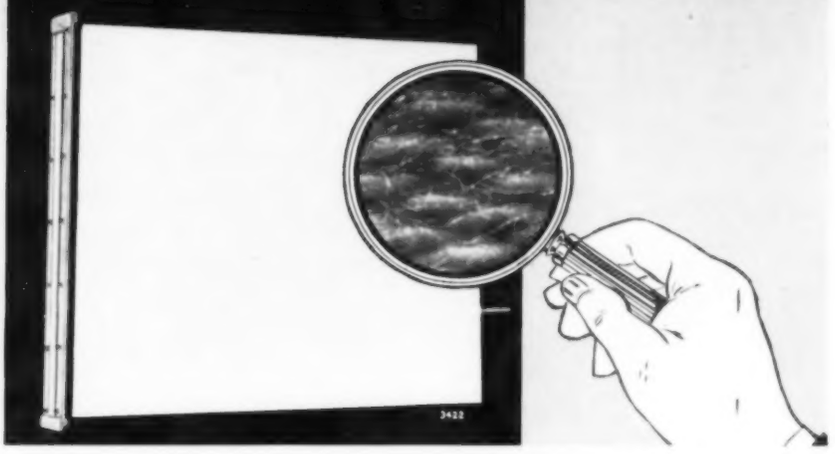
Ontario

AT THE January meeting, Ontario chapter of A.F.A., Toronto, operating practices and metallurgical advantages in use of cupola forehearths and teapot spout ladles were discussed by John Thwaites, foundry superintendent, Beatty Bros. Ltd., Fergus, Ont., and Hugh Davis, chemist, International Harvester Co. Ltd., Hamilton, Ont.

Describing his experience with the forehearth, Mr. Thwaites pointed out that it is usually circular and that correct dimensions are essential for satisfactory operation. Diameter of forehearth should be approximately the same as that of cupola at melting zone, but if larger capacity is required, diameter rather than depth should be increased. To speed heating of forehearth, minimum brick and maximum insulation consistent with good design should be used. Cupola forehearth is used to insure greater uniformity in metal through mixing out of contact with coke and to permit the furnace to melt more uniformly through more continuous operation. In general, modified forehearth designed to meet individual conditions provides easier

(*Continued on page* 62)

How SLY GIVES YOU BETTER DUST CONTROL



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In doing this the Sly Dust Collecting system uses a flat *special* cloth bag made of long fibre cotton, which cleans the air so thoroughly that there is no chance of the fine, injurious dust being carried back into the building.

This is an exclusive Sly feature in this price range. Where dust is collected by centrifugal force or washing, this high degree of filtering efficiency is difficult or impossible to attain.

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BLAST CLEANING EQUIPMENT SLY TUMBLING MILLS

DUST CONTROL EQUIPMENT FOR EVERY INDUSTRIAL PURPOSE

(*Continued from page* 60)

handling and better results than those of standard construction.

Certain advantages for teapot ladle as compared to forehearth were claimed by Mr. Davis in describing his experience with the former type of equipment. The tilting ladle is installed as a unit distinctly separate from the cupolas, making it possible to run a temporary spout across the top to pour in the regular in an emergency. The ladle used at his plant is U-shaped, 2500-pound capacity and capable of pouring and receiving metal at same time. It is covered with a removable refractory lined cover to within about 10 inches of end under the cupola spout. Lining consists of four layers of asbestos sheets next to the metal and two layers of brick over them. Surface brick expands to make a perfect seal and they only are placed in repairing the ladle. Lining costs amount to 3½ to 5 cents a ton depending upon tonnage poured, cost decreasing with higher production. Ladle should have sufficient capacity to permit metal being held 6 to 8 minutes for completion of reactions. Ladle should be kept well up to capacity all through the heat as advantage is taken of head pressure in purifying the force entrained slags out of bath.

Advantages of teapot ladle were enumerated as follows: Better mixing of metal; iron is given time to rid itself of entrapped impurities; there is better chance of approaching continuous pouring with consequently hotter metal; excellent opportunity is provided for treatment of metal for removal of sulphur or oxides and for addition of alloying elements that are better added in the ladle; improved machinability results from removal of sulphur and oxides and from increased uniformity of metal; percentge of scrap used in iron may be increased since any bad effects can be counteracted by good refining utilizing suitable cleaner and desulpherizer in ladle. Teapot ladle results in production of stronger, cleaner, more uniform iron at lower cost and the foundry is provided with iron that is more fluid even with lower temperature. This permits a lower phosphorous content which is reflected in products in the better resistant to shock. *F. L. White, official reporter.*

New Jersey

PRODUCTION of high test iron without alloys was discussed by Gottfrid Olson, foundry engineer, National Founders association, before members of New Jersey Foundrymen's association at the regular monthly meeting, Feb. 13, at the Downtown club. Approximately 85 were present.

Mr. Olson specified mixes for various types of castings, using up to 96 per cent steel, discussed forehearths and emphasized the importance of proper control of elements and materials. The speaker believes that the ill effect of sulphur is over-rated. In his opinion sulphur as high as 0.14 does little harm as long as the right amount of manganese is used. He suggested that for 0.10 sulphur, 0.60 per cent manganese be used; 0.11 sulphur, 0.70 per cent; 0.12 sulphur, 0.75 per cent; and 0.13 sulphur, 0.80 per cent.

He stated that too much emphasis was placed on tensile strength. In his opinion 45,000 pounds tensile was sufficient for the great run of cylinder and pressure work. He admitted that many specifications demand high tensile strength, and that foundrymen often are forced to meet these specifications or lose the business, but he believed foundrymen should use their influence in checking what he thought to be a trend toward unwarrantedly high tensile specifications.

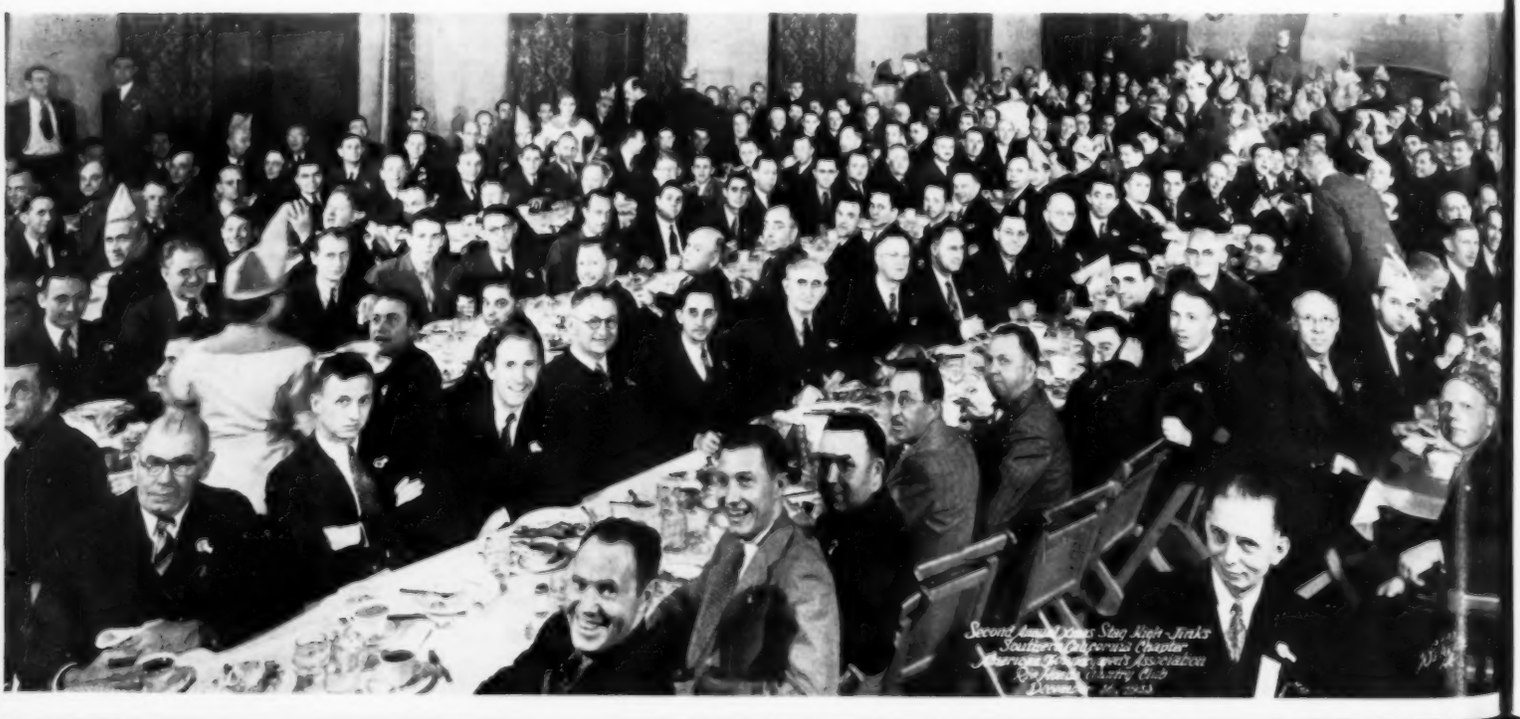
The speaker declared a built-in forehearth is better than a mixing ladle. He also believes iron from the forehearth retains its heat better. He described his idea of the best type of forehearth and added that a 9-ton cupola, for instance, should have a forehearth of about 2 tons capacity. Carbon, he said is picked up principally during the melting, with only a very small amount picked up in the well. He also contended that a large amount of steel in the charge does not require additional coke.

He further pointed out that steel melts at a hotter temperature than gray iron and cited various reasons as to why this was the case. Close attention to the amount of coke used between charges is important, the speaker said; also proper iron temperature in the chilling of light sections.

In a scheduled discussion, John A. Bukowski, Worthington Pump & Machinery Corp., Harrison, N. J., concurred in the statement that carbon is picked up mainly in the melting zone and added that the carbon pick-up varies with weather conditions, that when sulphur goes up carbon also goes up, and observed that this may be due to a higher concentration of gases resulting from higher barometric pressure. W. C. Reichert, Singer Mfg. Co., Elizabethport, N. J., said that high tension iron can be made either with or without alloys provided the design permitted, but added that if other special properties than strength were desired, alloys would have to be used. He confirmed the contention that high

(*Continued on page* 64)

More than 350 members and guests attended the second annual Hi-Jinx party held by Southern California chapter



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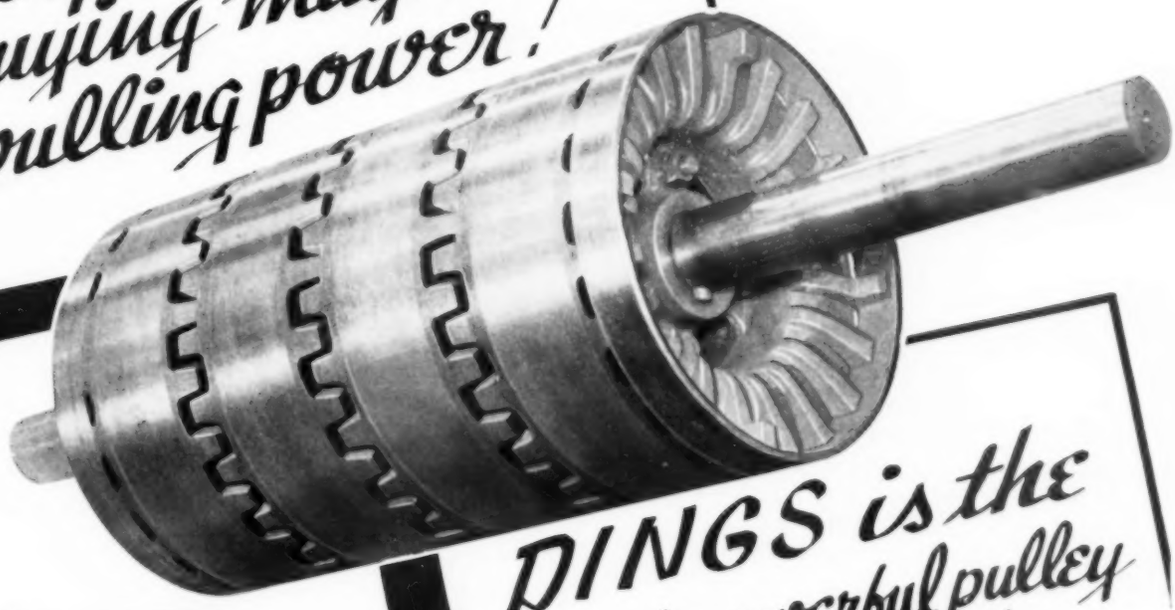

DINGS is the most powerful pulley on the market size for size!

FREE MAGNETIC ANALYSIS— *Regardless of what iron-removal method you use, send a sample of your used foundry sand to the Dings Laboratory. You may be amazed to find out how much iron is in it, how much iron can be taken out of it! No obligation. Send your sample today.*

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Dings gives you these greater savings because Dings gives you maximum iron-removal power!

BRONZE SPACERS — Dings uses bronze spacers and coil covers which do not short-circuit lines of force and reduce pulling power! One reason why Dings pulleys remove more iron.

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DINGS MAGNETIC SEPARATOR COMPANY
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(*Continued from page 62*)

test iron must be poured hot and also pointed out that the type of coke used has a definite bearing on carbon pick-up. Leonard Box, Deitrich Foundry Co., Newark, commented with particular respect to machineability.

A. E. Barlow, former president of the association eulogized James Flockhart, Newark, long regarded as the dean of Northern New Jersey foundrymen, who died recently in Florida at the age of 85. Mr. Flockhart was one of the founders of the organization in 1901.

Foundry business in northern New Jersey has undergone little real improvement since the first of the year, and while a pick-up in second quarter is anticipated, no definite signs have yet appeared, it was pointed out.—*B. K. Price.*

Buffalo

MEMBERS of the Buffalo chapter of the A.F.A. met in Gerry's restaurant, Buffalo, Feb. 6. At dinner two molders, Mr. Fisher and son from the Bingham & Taylor Foundry, Buffalo, entertained on the piano, accordion and mandolin and proved to be as able to make music as to make steel. They sang some old favorites and the 55 members present joined in.

E. A. Piper, foundry engineer, Pohlman Foundry Co., Buffalo, talked on casting design. He discussed and illustrated ways to pour castings for best results and his paper was very interesting and educational. It was noticed that during the discussion period many local foundrymen who had never before ventured any remarks were willing to get on their feet and give their opinions on this important subject.

Charles W. Briggs, technical adviser Steel Founders' Society of America, Cleveland, will speak on "Solidification, Shrinkage and Contraction of Metals" on March 6, at Gerry's restaurant.—*J. R. Wark, secretary.*

Connecticut

JANUARY meeting of the Connecticut Foundrymen's association was held at the Home club, Meriden, Conn., Jan. 20, with 46 members attending. Julian Greenstreet, manager foundry division, Textile Machinery Co., Reading, Pa., gave an excellent talk on "Managing a Foundry To Produce Quality Light Gray Iron Castings at a Profit." Exemplifying his talk by figures from his own company's operation, Mr. Greenstreet went into detail on properly evaluating costs of different castings and placing proper price on particular castings to enable a concern to compete profitably. Proper applications of overhead and labor were stressed. Mr. Greenstreet's talk was pertinent to today's foundry problems and was followed by an active discussion.—*H. S. Washburn Jr., secretary.*

Northern Iowa

SPEAKER for the January meeting of the Northern Iowa Foundrymen's association held Jan. 17, at Waterloo, was Fred J. Walls, International Nickel Co., Detroit, who spoke on trends and changes in the foundry industry. By means of slides Mr. Walls showed one of the new developments in cupolas with watercooling which permits longer operation without dropping the bottom. Other features of modern development shown were charging equipment, air weight control, briquetting of steel and cast borings, mixing ladles and alloy additions. Trend toward mechanized molding units also was discussed as well as developments in permanent mold process. Cast iron has undergone marked improvements as illustrated by the present high strength irons made possible with alloys. Present and future uses are found in sleeves, crankshafts, camshafts and other specialized applications where the physical properties obtained have made cast iron preferable. Lively discussion followed the completion of the talk.—*R. E. Wilke, president.*

St. Louis

NOTWITHSTANDING the stormiest weather St. Louis has suffered in many months, attendance at the Feb. 9 meeting of the St. Louis District chapter of the A.F.A., was the largest of any in recent years.

Following dinner the meeting was opened for business by L. E. Everett, Key Co., East St. Louis and vice chairman of the chapter. A number of out of town guests were presented following which the secretary-treasurer's report was read together with a letter from J. O. Klein, chairman of the chapter. While Mr. Klein has moved out of town, he continues as honorary chairman of the chapter. His letter expressed appreciation of the honor conferred upon him by the chapter board of directors. The report of the program committee was presented by Webb L. Kammerer who directed special attention to the coming March meeting when the Crane Co.'s picture "Flow" will be shown.

Report of the chapter conference committee, presented by Louis J. Desparois, Pickands Mather & Co., St. Louis, recommended that the fall conference of the chapter be held in St. Louis instead of Rolla, Mo. The recommendation was approved unanimously by the chapter and an announcement was given outlining the committee personnel to take care of a much larger conference which has been scheduled tentatively for Oct. 4, 6 and 7. The committee chairmen are as follows: Registration and arrangement, H. Goodwin, Medart Co.; visitation and transportation, M. A. Bell, M. A. Bell Co.; program, R. A. Jacobsen, Carondelet Foundry Co.; entertainment, L. J. Filstead, John C. Kupferle Foundry Co.; publicity and finance, J. W. Kelin, Federated Metals division, American Smelting & Refining Co.

C. E. Hoyt, executive vice president of A.F.A. outlined various national activities of the A.F.A. and discussed the coming Cincinnati convention, urging attendance. During the course of his talk Mr. Hoyt directed attention to the fact that a member of the St. Louis chapter, C. R. Culling, Carondelet Foundry Co., had been nominated a director of the A.F.A.

Marshall Post, national president of the association and vice president and works manager, Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa. then presented the feature talk. After preliminary remarks in connection with his having been a worker in St. Louis many years ago, Mr. Post gave a most interesting and instructive talk on cement molding, illustrating it with various photographs and outlining many interesting sidelights of this foundry work. After presenting several reels of motion pictures, Mr. Post led in the round table discussion of molding by this process.—*J. W. Kelin, secretary-treasurer.*

Central New York

FIRST regular meeting of the Central New York Chapter of the A.F.A., organized last month, was held at the Onondago hotel, Syracuse, N. Y., on Feb. 10. H. H. Judson, Goulds Pumps Inc., Seneca Falls, N. Y., presided and called upon Robert E. Kennedy, national secretary, who discussed the purpose of the meeting, and called for a report of the nominating committee which presented the following:

For chairman, H. H. Judson; vice chairman, F. C. Wheeler, Kimman & Wheeler, Syracuse, N. Y.; secretary, L. D. Wright, U. S. Radiator Corp., Geneva, N. Y.; and treasurer, I. L. Jones, International Heater Co., Utica, N. Y. Board of directors for 1 year, A. C. Davis, Cornell university, Ithaca, N. Y.; L. E. Hall, Syracuse Chilled Plow Co., Syracuse, N. Y., and J. J. Jardine, Caldwell & Ward Brass Co., Syracuse, N. Y. For 2 years, Leo Lonergan, Morris

(*Continued on page 67*)

ADVERTISING PAGES REMOVED

(*Continued from page* 64)

Machine Works, Baldwinsville, N. Y.; G. M. Thrasher, R. Lavin & Sons Inc., Elmira, N. Y., and W. G. Jones, International Heater Co., Utica, N. Y. For 3 years, F. F. Shortsleeve, Elmira, N. Y., N. H. Boardman, Elmira Foundry Co., Elmira, N. Y., and J. W. Barker, Andes Range & Foundry Co., Geneva, N. Y.

Nominations were accepted, and the slate elected as presented. Following the election Mr. Judson again assumed the chair, and presented R. K. Glass, Republic Steel Corp., Buffalo, N. Y., and treasurer of the Buffalo chapter, who congratulated the chapter on its formation, and extended the good wishes of the Buffalo group. At the same time to add a little amusement, he presented each of the officers with a memento or token in the form of early Woolworth baby rattles, carriages, layettes, and bottles. Then in a serious vein, he presented them with a handsome bouquet.

After introduction of the new officers, Mr. Glass then presented an extremely interesting talk on pig iron and coke which was illustrated with stereoptican views. Following his talk a technicolor film, "Steel, Man's Servant," was shown by courtesy of the U. S. Steel Corp.

Northeastern Ohio

AT THE first meeting in the new quarters in Guildhall, Cleveland, Feb. 9, approximately 200 members and friends of the Northeastern Ohio Chapter of A.F.A., listened to an interesting program on various types of shop equipment presented in 20-minute talks by representatives of seven manufacturing companies engaged in that field. Subjects included core blowing machines, cupolas and cupola charging equipment, mold handling equipment, recent development in core oven design, molding machine developments, cleaning equipment and methods for the modern foundry, and solution of dust control problems. Arthur J. Tuscany, Tuscany, Turner & Associates and executive secretary Foundry Equipment Manufacturer's association served as technical chairman.

Discussing core blowing machines, Russell F. Lincoln, sales manager, Osborn Mfg. Co., Cleveland, stated that the success of the process depended on three main factors, the machine, the corebox and the sand. With the first two designed, constructed and operated properly, sand mixtures may be developed to serve satisfactorily in a wide range of cores. With the aid of several slides he explained the principles of the machine, how it is operated and the many advantages it presents under certain conditions. Up to the present machines have been built capable of producing cores weighing 50 pounds and measuring 36 inches in length.

L. D. Reed, foundry engineer the Whiting Corp., Harvey, Ill., claimed that mechanical charging of the cupola has lagged behind the general trend toward mechanization not only in the foundry but in industry generally. He presented illustrations and figures to prove the advantages of the method over the usual hand charging methods. H. L. McKinnon, vice president C. O. Bartlett & Snow Co., Cleveland, briefly outlined the gradual evolution of mold handling equipment before presenting illustrations and descriptions of equipment and methods in use recently. C. A. Barnett, general manager Foundry Equipment Co., Cleveland, presented a brief description of the principles underlying proper core drying, followed by a running comment on a number of slides showing various types of modern mold and core drying ovens.

Slides showing two modern molding machines, one designed for high speed production on duplicate parts, and the other designed primarily for miscellaneous production in the jobbing shop, were utilized by Leon F. Miller, sales engineer, Osborn Mfg. Co., Cleveland, in presentation of his discussion on molding machine developments. Frank W. Pedrotty, engineer, American Foundry Equipment Co., Mishawaka, Ind., discussed the five usual methods of cleaning castings, wire brushing, tumbling, pressure blasting, water blasting and centrifugal blasting. Under certain conditions each method presents certain advantages and disadvantages. According to the speaker the centrifugal method in which metal abrasive is thrown against the castings from a rapidly revolving wheel is the fastest and most economical method so far devised. Interesting solution of many dust control problems was presented by F. A. Ebeling, sales manager, the W. W. Sly Mfg. Co., Cleveland.—*Pat Dwyer.*

Philadelphia

ABOUT 140 foundrymen and guests attended the Jan. 13 meeting of the Metropolitan Philadelphia chapter of A.F.A., held at the Engineers' club, Philadelphia. Harold L. Henszey, Carborundum Co., Philadelphia and chairman presided. Dr. Michael M. Dorizas, University of Pennsylvania, whose subject was, "Events in Germany and Czechoslovakia This Past Year," was the after dinner speaker. "Alloy Steel Castings" was discussed by V. T. Malcolm, director of research, Chapman Valve Mfg. Co., located at Indian Orchard, Mass.

Mr. Malcolm prefaced his remarks with the statement that the day of special alloy steel has arrived. At first the average foundry did not care to bother with these alloys, but their continued use and the persistent demand for them made foundrymen conscious of their need. As was evident from the beginning, these special steels not only cost more than ordinary steels, but specially trained men are needed to meet the rigid specifications which demand absolute control, not only of analysis of metal but also scientific study of every detail of steel casting.

Mr. Malcolm's paper embraced use of alloy steel castings in steam stations, oil refineries, transportation systems, etc., and covered the field of uses for various types of steels, various elements added, manufacture of these alloys, including molding, melting in various types of furnaces, pouring and heat treatment. He pointed out various troubles and difficulties encountered, such as blow holes, shrinkages, cracks, contractions and hot tears. The text of the talk dwelt on remedies for overcoming these difficulties as practiced in the Chapman Valve plant.

The subject of sand control, an important part played in alloy steels, was covered as was the interesting subject of heat treatment and welding. Mr. Malcolm told of the new technique of fabrication of alloy steel castings, one of the newest developments, in which various sections are made separately and then welded together. In closing Mr. Malcolm told of recent developments in radiography which has been used by his company for more than 15 years. He stated that no alloy casting was put in production until all kinks had been taken out by use of radiography.

Regular monthly meeting of the Metropolitan Philadelphia chapter was held in the Engineers club, Friday, Feb. 10, with 125 members and guests in attendance. W. C. Hartmann, vice chairman presided. Lee W. Harris introduced Rev. Philip J. Steinmetz, St. Pauls church, Elkins Park, Pa., who gave an interesting talk on "The Art of Living." A "Symposium on Sand" was taken care of ably by four members of the chapter who were introduced by John Juppenlatz, Treadwell Engineering Co., Easton, Pa., acting as technical chairman.

Clarence Thompson, New Jersey Silica Sand Co., spoke briefly on "Washed and Graded Molding and Core Sands," pointing out that sand shippers are required to grade, mix and test all sands shipped. Foundrymen today demand close gradation to meet their requirements in order

to produce much better castings.

Michael L. McGuire, George F. Pettinos Co. discussed "Millville Gravels and their Uses," and stated they have high refractory qualities but should be rammed hard in order to avoid penetration of metal and to eliminate rough castings and defective castings due to draw downs and blows. In his opinion foundrymen are not giving enough attention to backing sands, which should be of the same permeability as the facing sand or higher. One foundry he knows uses a permeability of 350 in producing high quality castings in sizes up to 50 tons each.

Cy B. Somers, Whitehead Bros. Co., New York, read a paper by A. J. Miller which gave the "History of Albany Sands," pointing out this type of sand is world known and is shipped to every country; that different locations give different sands; that grain size and grades from each location are vastly different.

M. R. Taggart, Taggart & Co., Philadelphia, spoke on "Naturally Bonded Molding Sands" especially adapted for castings from 50 pounds to 10 tons. He pointed out how foundrymen's requirements make it necessary for producers to develop special equipment in order to prepare properly the sands for shipment. He claims foundrymen should pay more attention to sintering and fusion points of sand and good sands should test at 2300 degrees Fahr. and 3100 degrees Fahr. respectively. He pointed out that moisture should be as low as possible for best results.

A general discussion followed with many questions by those present being answered by the four speakers. Next meeting will be held at Engineers club, Friday, March 10 when A. M. Ondreyco, Meehanite Corp., Pittsburgh, will read a paper on "Modern Developments in Cast Iron."—*J. T. Fegley, chairman, publicity committee.*

Detroit

ABOUT 85 members and guests attended the monthly meeting of the Detroit chapter held Feb. 16, with good representation from foundries in and around the city. Following the dinner, six new directors were nominated and elected to the executive committee. Terms beginning officially next fall, the new directors are for three years: V. A. Crosby, Climax Molybdenum Co., and Howard McCoy, Cadillac Motor division; for two years: Fred J. Walls, International Nickel Co. Inc., and F. A. Melmoth, Detroit Steel Casting Co.; and for one year: O. E. Goudy, Kelsey-Hayes Wheel Co. and Earl Morrison, Budd Wheel Co.

Preceding the feature address of the evening, an interesting motion picture on quarrying and preparation of sandstone was shown by the Cleveland Quarries Co. and National Foundry Sand Co. L. A. Danse, metallurgist, Cadillac Motor division, outlined the extensive investigation which his staff and the Cadillac foundry staff under direction of H. B. Swan has been making over the past three years on the cause and cure of cracks appearing in some V-8 cylinder block castings.

These cracks developed in the midsection of the center bulkhead of the casting, between the camshaft bearing hole and crankshaft bearing hole, and were first noticed when the new design of block was placed in production in 1935. They did not appear in all castings, but at times scrapped blocks ran as high as 50 per cent, although this figure has now been reduced to 2 per cent or less.

The cracks occasionally would not appear until days after the casting had been poured, showing up often when the oil hole was drilled between the two bearings.

To obtain a definite picture of how this center section was cooling, first eight, then 12 thermocouples were spotted across the bulkhead before pouring so that temperature charts could be obtained on cooling rates of different points in the section. Reinforced with these data, discussions then were held attempting to correlate such factors as pouring, primary cooling, shakeout, secondary cooling, core knockout and other phases.

Attempts were made to cure the trouble by casting both camshaft and crankshaft bearing holes solid, but this did not prove entirely successful. Then 86 feet of cooling conveyor housing was added and the conveyor lengthened to 380 feet with housing walls insulated where exposed to outside atmosphere. Intensive study was made of shakeout time and temperature to determine what effect these factors might have on differential cooling rates. Critical temperature and dilatometer curves on specimens of the iron were prepared and analyzed.

A cooling oven on the carryoff conveyor was proposed, but excessive cost ruled this out. Then the unorthodox suggestion was made to admit water to the center bore of the casting just after it was poured, with the idea of removing a measured amount of heat from this area and balancing the cooling rate with other portions. While workmen ran for cover, three quarts of water were added, but strangely no explosions resulted and the desired heat removal was achieved, but still the outside of the casting cooled too fast.

At this stage it was decided to knock the cores from the casting after it had been removed from the drag and immediately rout the casting into a welding preheating oven at 1100 degrees Fahr., designed with a so-called entering and soaking zone of sufficient length to bring temperatures uniformly to 1100 degrees; and a cooling zone which would reduce the temperature to 400 degrees in 2½ hours. Conveyor speed was set at 24 inches per minute, or 45 blocks per hour.

Use of this controlled-cooling oven, plus changes effected in gating, pouring, shakeout and all the other factors investigated, has resulted in virtually eliminating cracked block castings. The cracks were being caused by heat unbalanced in the casting, whereby adjacent sections would be shrinking and expanding simultaneously, thus setting up terrific internal stresses which, sooner or later, gave way and produced cracks. The problem resolved itself in how to correct this unbalanced condition.

In conclusion, Mr. Danse suggested that foundrymen might well devote more attention to study of critical temperature-dilatometer curves of iron and the indicated effect of cooling rates on properties of castings.—*A. H. Allen.*

Chicago

THE Chicago chapter of the A. F. A. will stage its famous annual Ladies' night on Friday evening, March 17 at the Medinah club, 505 North Michigan avenue, Chicago. A reception will start at 7 p. m., the dinner will follow at 8 p. m., a floor show will be provided at 9:30 p. m. and dancing will last until the early hours. Tickets for the event, which this year is held on St. Patrick's night, will be $2.50 each. P. V. Martin 3426 East Eight-ninth street, Chicago, is secretary of the Ladies' night committee.

Michiana

NEWLY formed Michigan-Indiana chapter of the A. F. A. held its regular meeting Feb. 10 at the Oliver hotel, South Bend, Ind. The board of directors met prior to the dinner and completed plans for handling the new chapter's business. Chairmen and members of various committees were appointed and the name Michiana officially was adopted. Approximately 100 members attended the dinner meeting and were welcomed into the national organization by C. E. Hoyt, executive vice president of the A. F. A., who had traveled to South Bend for the occasion.

Following dinner, Marshall Post, national president of the A. F. A.

(*Concluded on page* 70)

IN PIG IRON, TOO, THERE'S A VAST DIFFERENCE

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(*Concluded from page* 68)

and vice president, Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa., addressed the chapter on "The Cement Molding Process." Mr. Post began his lecture by outlining the history of the iron and steel industry in Birdsboro and touched on the founding and development of the Birdsboro Foundry company and its enlargement through the years to its present size. He then discussed the cement molding process in detail, covering every angle of a molder's problem and every advantage of the process. The lecture was beautifully illustrated with moving pictures and stereoptican views showing preparation of molds in the shop and the proportions of the finished castings. The chapter was particularly interested in the description of the large steel castings used in ocean-going vessels and the problems involved in producing castings of this size.

M. J. Lefler, Western Foundry Co., Chicago, and chairman of the chapter announced the next meeting would be March 15 at the Oliver hotel and D. J. Reese International Nickel Co., New York would discuss cupola practice.—*L. L. Andrus, secretary-treasurer.*

Conn. Nonferrous

AN INTERESTING discussion of "Molding and Pouring a Centrifugal Casting" by Stafford W. Chappell Jr., Electric Boat Co., Groton, Conn., featured the regular meeting of the Connecticut Nonferrous Foundrymen's association held Jan. 7 at the Hotel Duncan. Howard A. Phelps, Phelps Foundry Co., Ansonia, Conn. and president of the association, presided.

Mr. Chappell's talk was illustrated with diagrams, sketches and sample cores of a sectional cylindrical bronze casting ⅜-inch thick, 22 inches in diameter and 10½ feet in over all length. The finished casting is subjected to 150 pounds water pressure test. The casting is poured from metal having the following composition: 88 per cent copper, 8 per cent tin, and 4 per cent zinc. Two ounces of 85-15 phosphor copper was added to each 100 pounds of metal. About 3000 pounds of metal is required for each casting and the contents of the ladle is poured into a runner box before the plugs are pulled. This eliminates disturbance and prevents dirt and dross from entering the casting. The pouring temperature is between 2150 and 2200 degrees Fahr.

Mr. Chappell presented an interesting discussion of the construction of the mold, the type of sand used, and the construction and materials used in the cores. An interesting question and answer period followed Mr. Chappell's presentation.—*Louis G. Tarantino, secretary.*

To Hold Conference At Rutgers

A regional foundry conference will be held April 1 at Rutgers university, New Brunswick, N. J., under the sponsorship of the Philadelphia and the Metropolitan New York-New Jersey chapters of the A.F.A. and the department of mechanical engineering of Rutgers university.

The locale of the conference, New Brunswick, N. J., is steeped in historical traditions which trace back to the Revolutionary war period. The university which was founded in 1766 at Queen's college, lists many prominent members of the industrial world among her alumni. The spacious, 2-story gymnasium, where the technical sessions will be held, is on the site of the first intercollegiate football game in history, which was played on Nov. 6, 1869, between Rutgers and Princeton.

The conference will be opened on Saturday morning at 9 a.m. with a registration period. Then, following a welcoming address by P. H. Daggett, dean of engineering at the university, the technical sessions will be held in the following order.

Morning Session—10:00 *a.m.*

Chairman: John Howe Hall, consulting engineer, Philadelphia.

"Castings from the Consumer's Viewpoint," by Norman L. Mochel, Westinghouse Electric & Mfg. Co., Philadelphia.

"Castings from the Producer's Viewpoint," by J. C. Pendleton, Newport News Shipbuilding & Dry Dock Co., Newport News, Va.

Afternoon Session—2:00 *p.m.*

Chairman: Sam Tour, Lucius Pitkin, Inc., consulting engineers, New York.

"Casting Defects as Affected by Sands," by W. G. Reichert, Singer Mfg. Co., Elizabeth, N. J.

"Casting Defects as Affected by Gates and Risers," by H. H. Judson, Goulds Pumps, Inc., Seneca Falls, N. Y.

An informal buffet luncheon has been arranged for noontime to afford an opportunity for shop talk among the attending foundrymen, while a dinner at the Roger Smith hotel in New Brunswick will climax the meeting. The chairman of the dinner meeting will be Marshall Post, national president of the American Foundrymen's association and vice president of Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa. E. C. Barringer, executive secretary, Institute of Scrap Iron and Steel Inc., New York, will be the principal speaker.

Foremen Must Play Important Part

Approximately 500 plant foremen from central Illinois attended a banquet recently at Hotel Pere Marquette, Peoria, Ill. to hear Glen Gardiner of New York, noted industrialist, author and lecturer, speak on "The Foremen's Job in 1939." The meeting was held under the Employment Managers Club of Peoria. The speaker was introduced by M. J. Gregory, manager foundry division, Caterpillar Tractor Co., and chairman of the Quad City chapter of the A. F. A. Mr. Gregory formerly worked with Mr. Gardiner at Sampson Tractor Co.

In his discussion the speaker pointed out that foremen have the same problems in their department that beset the head of the company for which they work. They have in their department a payroll, a material investment, their own part of the overhead expense. Therefore they must be guided by the same principles of good management.

Mechanical Engineering building, Rutgers university, New Brunswick, scene of April 1 conference

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Casts Diesel Engines

(*Continued from page* 25)

on a plain, straight runner with two or three small branches extending over the top of each ring at a tangent. Where the metal is poured rapidly, these gates fill the molds satisfactorily. After the castings are shaken out the stumps easily are removed. In addition to other advantages it is stated that the amount of metal in the gates and sprues, that is the extra amount of metal which has to be melted to fill the molds, is less than the amount required in other methods of gating.

Aluminum for the crankcases and other castings—aluminum 91 per cent, copper 2 per cent and silicon 7 per cent—is melted in a battery of drum type, revolving open flame furnaces. The melted metal is subjected to a secondary treatment for removal of gas and oxide inclusions. Details of the process worked out by the company's technical staff over a period of several years are not available for publication. The principle involved is the affinity of chlorine for hydrogen. The metal is poured into the ordinary type cast iron pot generally employed for melting aluminum. A gas flame under the pot maintains the metal at the proper temperature, approximately 1400 degrees Fahr. The end of a $\frac{3}{4}$-inch steel pipe is lowered into the metal and a stream of chlorine gas under pressure is allowed to bubble through the bath for a short period. Volume of gas and duration of period are the two most important features in the process. At the end of the period the resulting dross is skimmed from the surface and the perfectly clean metal with practically no oxide film is taken to the molding floor and poured into the molds.

Strenuous requirements in operation, higher speeds, greater power and acceleration, secured by increasing the compression, higher expansion and contraction due to intermittent heating and cooling, present a serious problem in the production of diesel engine cylinders. To a gratifying extent the problem has been solved in the Mack Trucks foundry by the adoption of a nickel-chromium alloy cast iron. General foundry experience in recent years indicates that the addition of small amounts of nickel and chromium tends to promote greater uniformity of structure, hence temperature changes are diffused uniformly. The castings are denser and less liable to chilling or brittleness in thin sections. Hardness is increased without materially reducing machinability.

Castings Are Heat Treated

The nickel-chromium alloy in this instance provides a close grained sorbitic structure which in addition to resisting rapid changes in temperature adds strength to resist the major stresses due to unavoidable variations in temperature at various parts of the cylinder block. After the cylinder castings are cleaned they are heat treated to relieve stresses in accurately controlled and specially designed electric furnaces. Composition and properties of the alloy iron for the cylinder blocks show: Total carbon 2.80 to 3.30 per cent; combined carbon 0.55 to 0.80 per cent; manganese 0.50 to 0.75 per cent. Tensile strength of the metal is between 38,000 and 40,000 pounds per square inch. Average hardness — readily machinable—229 brinell.

Alloy iron in the cylinder heads differs to some extent from the iron in the cylinder blocks. Subjected to higher temperatures than the blocks, the heads require dimensional stability, lessened expansivity, and toughness. Composition to meet these requirements shows: Total carbon 2.90 to 3.30 per cent; combined carbon 0.65 to 0.80 per cent; manganese 0.50 to 0.80 per cent; silicon 1.50 to 1.60 per cent; nickel 2.00 to 2.50 per cent; chromium 0.30 per cent maximum. Based on a high steel content in the charge it is claimed this iron is the closest to the ideal material for cylinder head developed up to the present. The head castings also are heat treated in special furnaces.

For brake drums a nickel-chromium alloy cast iron has been developed which shows a tensile strength of 48,000 pounds per square inch. This iron with a 2 to 2.50 per cent nickel content and a suitable balance of other elements remains stable even for prolonged periods at a temperature of 1200 degrees Fahr. The metal represents the result of extensive research and experiment over a period of many years. Investigation found that a soft drum would not score or squeal but unfortunately it lasted only a short time. Very hard blocks became scored. By limiting the silicon content and introducing the proper amount of chromium in relation to the nickel, nonscoring prop-

(*Concluded on page* 75)

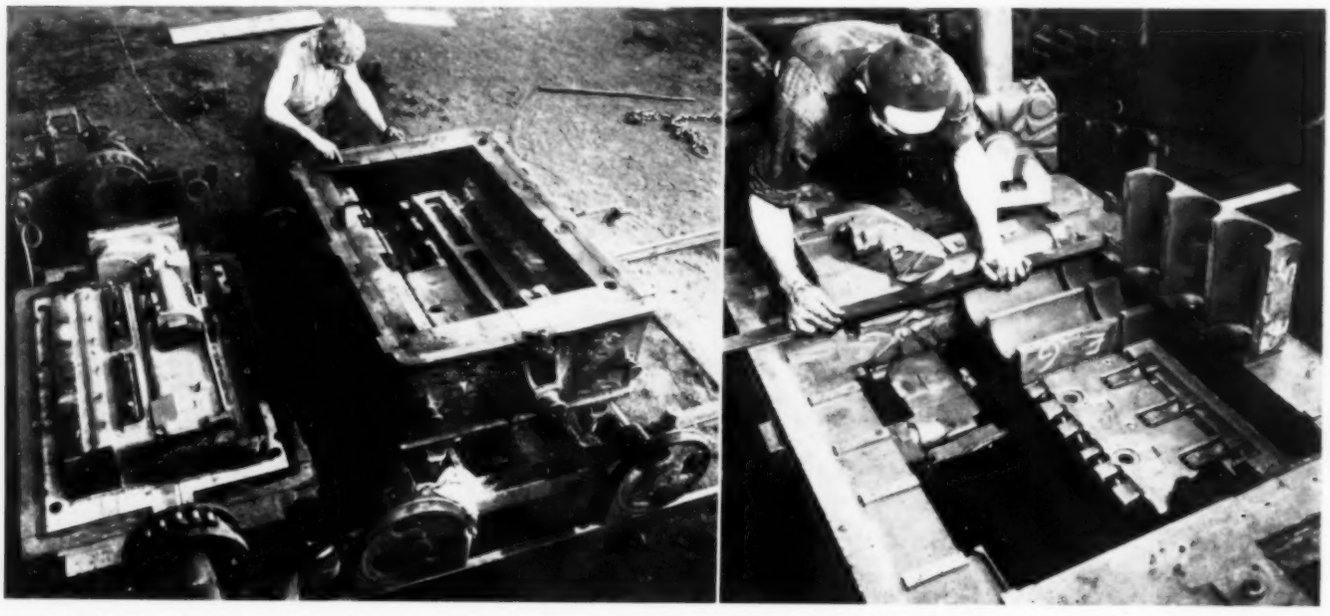

Fig. 8 (Left)—Half molds are made on a jolt rollover pattern draw machine and lowered on to a runout car and then to position on the pouring floor. Fig. 9 (Right)—Cores are set with care and precision

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We in the United States are only 7 per cent of the world's people. We own half of all the wealth in the world. We have 71 per cent of the world's automobiles, 52 per cent of its telephones and 40 per cent of its radios. How did all this come about?

Why is the standard of living in America higher than anywhere else? Why are we so well off that we consume one-fourth of all the sugar produced in the world, one-fourth of the coffee, and three-fourths of the silk? Why do we use one-half of the world's production of coal, and one-half of all the electric power? All for a mere 7 per cent of the world's population!

If you provide a complete answer to all these questions, you will also have given a good answer to the question "what is business," for it is through the workings of business that America has won economic leadership. Without our highly developed business mechanisms, 45,000,000 willing workers could never have produced our unparalleled standard of living, not even if all the earth's riches were beneath our soil and if all our farm land were the most fertile in the world.

Collectively, business is merely the production and exchange of commodities. Individually, businesses in this country are a million separate enterprises, producing, selling, and transporting things, and financing the flow of trade. Business men are the people who make a living by conducting these million separate enterprises and who take the risks of owning them. From the corner grocery to the big steel company, each independent unit in our business system is working hard for that success which can be gained only by serving and satisfying its customers.

Business is good when these one million separate businesses are busily making and exchanging their products. They do this when costs and prices are in proper balance, and when the existing purchasing power is actively being used by consumers and by industries in buying from one another.

Businesses stimulate buying activity by offering better merchandise and more attractive values, and by advertising them widely. This is the way all new industries have been built. It is the way business operates normally in building prosperity.

Whatever else may have helped, the American spirit of business enterprise has been the mainspring of our progress, aided at every point by the use of good advertising in distributing the products of industry. The high standard of life in America is an achievement of business, and it is not the nature of business to be satisfied with past performances. The imagination is challenged by goals of the future.

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(*Concluded from page* 72)

erties could be secured with the hardest blocks with little wear and with stability of the metal under elevated temperature conditions.

Various stages in the production of a mold for a cylinder block casting are shown in the accompanying illustrations Figs. 1 to 4 and Figs. 8 and 10. The mold is made in a two-part metal flask with a great number of vent holes for the ready

Templets and gages are employed in setting the cores

escape of steam and gas. Each flask part is a one piece casting, machined on the upper and lower face and provided with a suitable guide at each end of the joint side for locating the cope on the drag. A wood frame is placed temporarily on top of the flask to hold the heaped up sand. The mold is rammed on a jolt, rollover molding machine made by the Osborn Mfg. Co., Cleveland, and the required density of sand on the upper layer is secured by going over it with a pneumatic rammer. Flasks are provided with a set of shallow bars which hold the sand in place without the use of a bottom plate. Later, when the drags are placed on the floor they are supported on light steel battens. In this manner gas and steam may escape readily when the mold is filled with metal. Each mold part is rolled over on the machine and placed on a runout car provided with a self leveling device which assures accurate drawing of the pattern. The molds are blackwashed lightly with a spray gun and then skin dried with an oil torch. This treatment imparts a hardened skin to the face of the mold which serves the double purpose of preventing erosion from the flowing metal, and of producing a clean, smooth skin to the casting.

Combination barrel and crankcase cores are made in halves then pasted together before each unit is placed in the mold. To insure the required degree of dimensional accuracy where machining allowance in the barrels is measured in thousandths of an inch, each half core is placed in a jig as shown in Fig. 2, and passed under a surface grinder. Templets and gages are employed extensively in setting the various cores in the mold as shown in Figs. 9 and 10 where the molder is shown checking the positions of the lower water jacket core and the first barrel core respectively.

Approximately 700 pounds of metal is poured into each mold. The metal at a temperature of 2700 degrees Fahr., is poured from a covered, insulated ladle into a pouring basin on top of the cope. Sprues formed in dry sand cores conduct the metal in two streams to the joint line of the mold, where a strainer trap catches any stray foreign material. The metal then continues downward through two sprues to a long runner and a number of shallow gates entering the lower edge of the crankcase.

Adventures of Bill

(*Concluded from page* 52)

bottom and departed for the molder's heaven where back aches and sweat are unknown, every casting is perfect and every day is pay day.

"However, this lad I'm telling you about still is as brisk as a bee and has been superintendent of a prominent foundry for many years. He took his trusty pen in hand and sent me the following epistle:

Some years ago range manufacturers throughout the country conceived the idea that it would improve the appearance of their ranges if after polishing the range tops, covers, etc., they gave them a *gun metal* finish that would be permanent and resist the discoloration that inevitably occurs above the fire box after the range has been in use for a more or less long period. You and I readily can recall how our mothers insisted on polishing the tops of the family range with common black lead polish every week or even more frequently if needed. The top rails and covers, etc., were not even polished. They were just raw castings, but they looked pretty good at that after the black lead application. That was my job many a time on Saturday afternoon and I imagine you boiled over many a time when the autocrat of the breakfast table, and for that matter the dinner table and the supper table set you at this highly distasteful task. The work itself imposed practically no burden on a strong active body. The hardship, the injustice, the cruelty of the imposition lay in the fact that the precious hours of sport on the outside were flying past, never to be overtaken. There is no common practice in the stove industry in the finish they give their range tops. I shall confine myself to our own form of treatment. The tops, covers, etc., are first polished and then assembled. Thus assembled they are heated in a gas fired furnace to a temperature between 900 and 1000 degrees Fahr., in other words to a dark red. Then withdrawn and left to cool to a temperature that will not cause the oil to smoke when applied. The heated surfaces are painted liberally with raw linseed oil. When the castings have cooled to room temperature the surplus oil is wiped off thoroughly.

"How could you have cut down that correspondence to post card size?"

"Easy enough," said Bill. "I should have taken the original letter, re-directed it to the Prairie Belle people and let it go at that!"

Lists Stock Sizes of Cupola Blocks

Division of simplified practice of the National bureau of standards has prepared printed copies of the first revision of Simplified Practice Recommendation R154, Cupola Refractories. This revision will be identified as R154-38.

The recommendation lists stock sizes of 6-, 9-, and 4½-inch cupola blocks, and tap-out and slag-hole blocks. It was approved in its original form in 1932 by a general conference of producers, distributors, and users, and after being modified to accord with certain suggestions received upon its submission to the industry for consideration, became effective in March 1934.

The present revision adds nine sizes of 6-inch cupola blocks for diameters larger than those formerly listed, a new schedule of 20 9-inch blocks for outside diameters ranging from 66 to 168 inches, and 8 4½-inch Colliau blocks for outside diameters from 25 to 82 inches.

Copies of this recommendation may be obtained from the superintendent of documents, Washington, for 10 cents each.

Name Agents

Grant & Co., 2144 East Seventh street, Los Angeles, have been appointed agents by the Osborn Mfg. Co., 5401 Hamilton avenue, Cleveland, for the sale of molding machines, core blowing machines and accessories in southern California and the state of Arizona.

Snow & Galgiani, 537 Second street, San Francisco, with a branch at 305 N. W. Twelfth avenue, Portland, Ore., have been appointed agents for central and northern California and the state of Oregon.

Gray Iron Practice

(*Continued from page 27*)

range of properties obtained in the last 15 to 20 years. In 1921, practically all gray iron could be classed as iron of 18,000 to 24,000 pounds per square inch minimum tensile strength. Today the A.S.T.M. recognizes classes of iron ranging in tensile strength from 20,000 to 60,000 pounds per square inch.

At the recent A.F.A. convention, Young, Crosby, and Herzig, Preprint No. 38-8, A.F.A., 1938, described commercial irons running as high as 80,000 pounds per square inch. Smalley, *Foundry Trade Journal*, Vol. 50, 1934, A. B. Everest, gives the potential strength of cast iron as 130,000 pounds per square inch. It is not uncommon for regular cupola iron to run from 35,000 to 40,000 pounds per square inch. By special processing and by alloying, these figures can be raised to from 50,000 to 80,000 pounds per square inch.

However, tensile strength is only one, and at that a rather limited, mark of quality of iron. Sometimes it is of little consequence and may even impose an actual sacrifice of other qualities which make for good performance. Damping capacity and machinability are qualities such as are affected adversely by tensile strength. Tensile strength is an indicator of soundness and of the structural make-up of the iron. In that regard it is useful. It is seldom of major importance in engineering design and, therefore, does not compare in usefulness with the rigidity, compressive strength, and transverse properties of cast iron.

Transverse test is very informative and in some regards much more so than the tensile test. From it are obtained transverse strength, deflection, modulus of rupture, modulus of elasticity, resilience, and other lesser property values. The ease of testing for transverse properties makes the transverse test much more useful from an engineering point of view than the tensile-strength test, even though about the same information can be obtained from both tests. After all, properties of castings should be looked upon from the point of view of the engineer or customer, and hence castings should be provided with such qualities as make them satisfactory for the intended service and should not be made merely to satisfy some arbitrarily imposed physical test standard.

Other Types Available

A number of new types of irons have been developed that do not depend upon tensile strength or other physical properties for their immediate value. Heat and growth resistant irons, nonmagnetic irons of the austenitic type, used for their nonmagnetic properties as well as for their corrosion resistance, martensitic irons for wear resistance, and chilled irons having a martensitic matrix and, therefore, with an extremely high chill hardness together with a tough core, now are available.

There are occasions where practices more common in the steel industry are being followed to better the quality and usefulness of gray iron. For example, heat-treating practices are being employed to *age* castings, to increase the hardness and wear resistance of the iron, and to refine the structure; so-called *deoxidizing* practices carried out in the ladle rapidly are being adopted to refine the structure and improve mechanical properties; nitriding methods are being employed to obtain surfaces of extreme hardness, and welding is being experimented with in building up of composite structural members. More will be heard about these practices in the future, and foundries should be prepared and receptive to adopt them as the need arises.

It seems that the economy and advantages, and the increased necessity for metallurgical control are quite evident. However, the question is: Will it pay, particularly in the smaller foundry? Some of the advantages that may be obtained are as follows: Metallurgical control tends to produce uniform iron, that is, iron which is the same from day to day, and undoubtedly permits standardization on a few instead of a large number of irons to satisfy the wants of most customers. If that is possible, the number of mixes used in the foundry can be reduced greatly. Metallurgical control should make possible the purchasing of pig iron, coke, sand, and other foundry raw materials from reputable producers close at hand. It is a fact that the best results are not obtained with either cheap or expensive materials unless knowledge of how to use them is available.

Hold Different Opinions

On this matter of quality of raw materials, in the case of pig iron, there are some who have little reason to believe that special treatments given the iron or certain inherent qualities of the iron survive as far as the tap hole. Others feel strongly the other way. Whatever the belief may be, the facts are that, in most cases, such inherent qualities can be masked easily by other factors that come up in melting. For that reason, it is difficult to trace the quality of the finished casting to any particular quality of the pig iron or other materials used in the charge.

Boegehold, *Transactions*, A.F.A. 1929, investigated the quality of iron as affected by blast furnace practice on the assumption that pig iron must be subject to variations in physical character due to constant fluctuation of blast furnace operating conditions. He tried to tie that in with the properties of the iron from the cupola. After a good deal of painstaking work on large-scale operations, he found that the quality or combustion of the coke and the amount of water in the blast in both the blast furnace and the cupola had an influence on the resultant properties of the irons.

No clear-cut relation between the quality of pig iron and quality of

(*Concluded on page 78*)

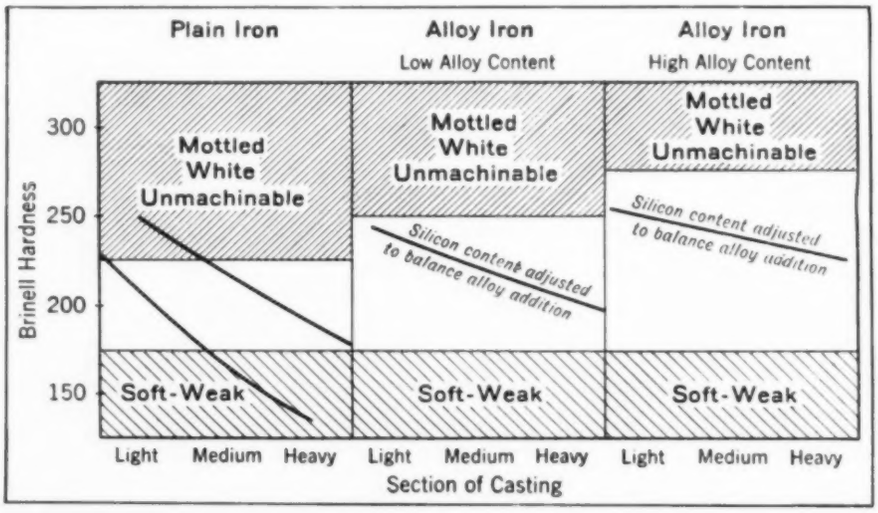

Fig. 4—Reproduction of Merica's diagram showing effect of alloys on widening the range of mechanical properties of pearlitic and machinable cast irons

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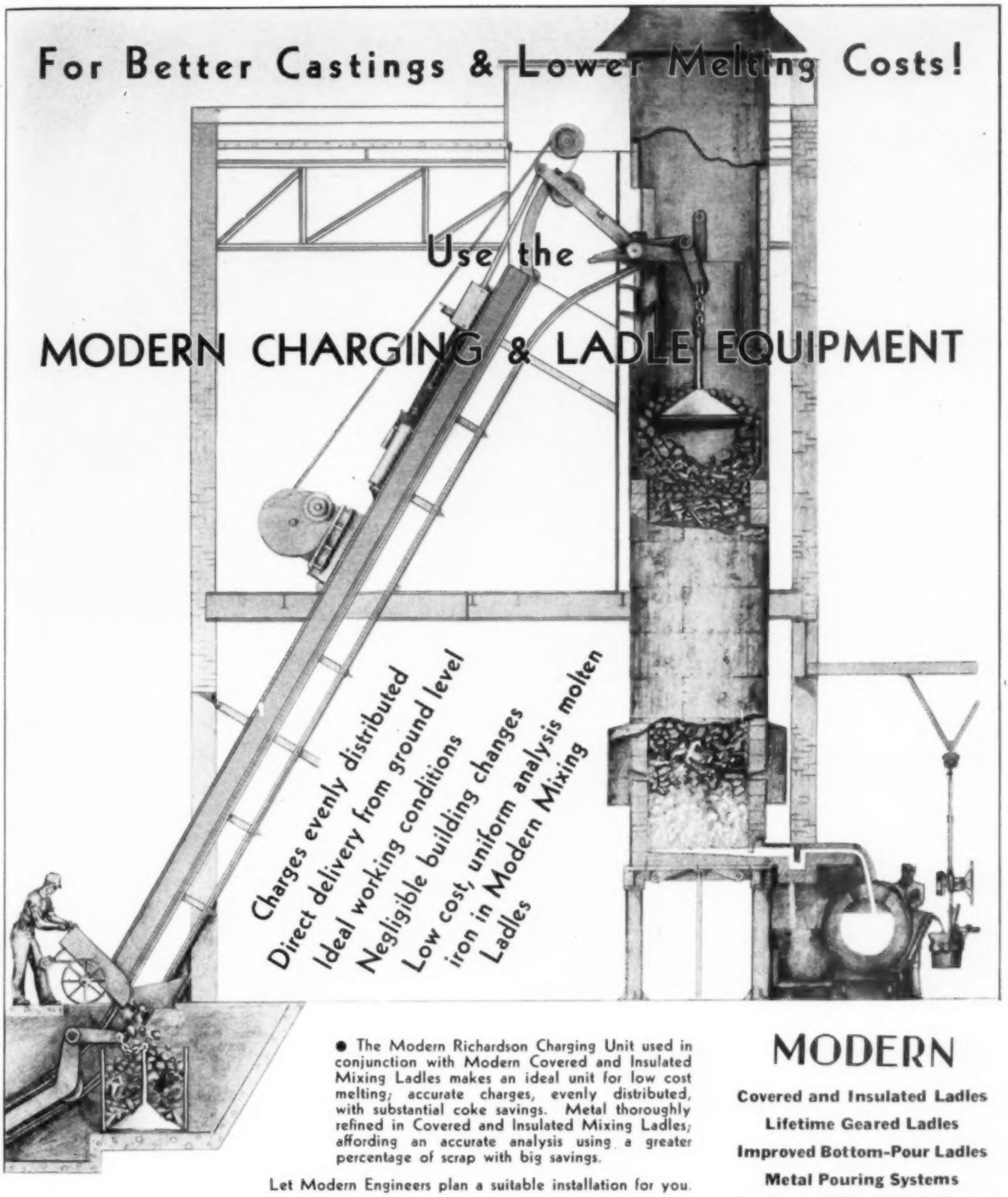
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● The Modern Richardson Charging Unit used in conjunction with Modern Covered and Insulated Mixing Ladles makes an ideal unit for low cost melting; accurate charges, evenly distributed, with substantial coke savings. Metal thoroughly refined in Covered and Insulated Mixing Ladles; affording an accurate analysis using a greater percentage of scrap with big savings.

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Sand Conditioning Systems

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(*Concluded from page 76*)

castings made from it was noticed, even though his tests seemed to demonstrate that physical characteristics of pig irons persist to a degree during remelting in the cupola and to some extent influence properties of the cast iron. That this relation of pig iron quality to cast iron quality is not very significant is supported by a statement of Boegehold in which he said:

"It would seem that the custom in vogue for some time past in referring to satisfactory and unsatisfactory pig iron as good and bad pig iron is not particularly well chosen. . . . . The pig iron which may be satisfactory for one man's need may be unsatisfactory for another, and vice versa. If a foundryman has adapted his melting practice to give him good results with a particular kind of pig iron, he will probably have trouble with other kinds, and so be inclined to call the pig iron bad which gives him trouble, but a readjustment of his melting practice might give him just as good results with that iron."

Consult Foundry Literature

To go about getting and maintaining this control, obviously it seems necessary to look toward the metallurgist or to someone with metallurgical training for advice. It is evident that few foundry employers or employes can digest the vast amount of metallurgical literature that is being provided for them through publications and through the various technical societies.

To assimilate this metallurgical knowledge requires long experience and training, and the foundry would gain by employing an experienced man who could make use of this knowledge. Smaller foundries may find this too expensive, in which case it falls to the lot of the foundry executive or superintendent to translate modern technical knowledge into practice. How successfully this can be done depends on the training and ability of these individuals.

Primary responsibility of the metallurgist should be the metal going into each job, to see that it is suitable and that the composition meets the sometimes conflicting requirements of the foundryman, the production engineer, and the user. In order that he may function properly, the metallurgist should control melting from the purchasing and proportioning of the raw materials on through the melting operation to the metal coming from the spout, while his responsibility for the metal should carry on to the finished casting. For results, he needs co-operation of executive and foundryman, and they in turn need his. In that way much of the gamble in results would be removed.

Certain qualities of gray iron make it indispensible for many engineering applications. A few years ago THE FOUNDRY published a serial article entitled "Gray Iron Possesses Valuable Engineering Properties," Feb. to Nov. 1930 issues inclusive, which summarized many of the desirable as well as undesirable properties of gray iron. Among the desirable properties were mentioned the castability of the iron and some of its properties peculiar to itself. Thus it stated that gray iron usually is sound because of its low contraction and high fluidity. It has a relatively low melting temperature and, therefore, has good casting properties. It is markedly uniform, has good machining properties, shows little waste in risers and gates, and can be cleaned at low cost.

Gray iron possesses high compressive strength, excelling any of the common metals in this property. It has a high modulus of rupture and possesses exceptional wear resistance. Galling and seizing tendencies are absent. Its strength up to 800 degrees Fahr. is good. It resists corrosion fairly well, being in most cases slightly superior to steel or wrought iron in that regard, and resists distortion to a remarkable degree. It is distinctly a low-cost product. Two unique properties of gray iron not mentioned at that time have become significant in a number of engineering applications. They are damping capacity and low notch-sensitivity.

Shows Undesirable Properties

Some of the less desirable properties possessed by gray iron mentioned at that time are: Low Young's modulus, somewhat in the neighborhood of 10,000,000 to 15,000,000 for regular engineering grades (this means its stiffness is from one-third to one-half that of steel); a lack of ductility; poor welding qualities; and almost a total absence of the ability to be fabricated cold or hot, although recently Forbes, *Metal Progress*, Vol. 33, 1938, described the hot working of white iron into sheet and shapes.

While the good grades of iron are fairly tough, their toughness in no way compares with the toughness of steel. Soft grades of iron are distinctly not tough, and their grain structure may be quite open. The irons with dendritic graphite also lack toughness. At times the iron may chill in spots, making it difficult to machine. At moderately elevated temperatures, in the presence of steam and certain mild corrosive fluids, growth sometimes takes place, while at higher temperatures, growth often accompanies oxidation.

Selection of a proper iron for a given purpose often demands some sort of compromise between its more and its less desirable properties, but cast iron is not alone in having such limitations. In many applications properties peculiar to gray iron are important enough to outweigh other shortcomings it might have. For example take the power of gray iron to damp out vibrations. Vibration and its effects are likely to be met with in many engineering structures, and because of its unusual damping resistance, cast iron offers greater resistance to vibration and greater resistance to effects such as whipping than does steel.

High damping capacity of gray iron is a strong argument in favor of its use in meeting competition from welded steel structures. This characteristic has been taken advantage of in developing cast cam and crank shafts. It also is bringing about radical changes in design of high-speed rotating parts. The damping capacity increases with an increase in the fiber stress and tends to be less for stronger irons than it is for weaker irons, as is shown in Fig. 1.

Iron Resists Vibration

Here, quite a marked difference in damping capacity of alloyed and unalloyed irons, as well as the increase in damping capacity, expressed as the per cent energy lost per vibration, with fiber stress, is shown. Therefore, weak irons are more satisfactory than strong irons for resisting vibrations. That is one very serious handicap in attempting to utilize the damping capacity of gray iron to the fullest extent. The solution to this problem may be in the use of highly alloyed irons or in heat treatment.

But even more remarkable than damping characteristics is the unusual resistance of gray cast iron to failure at notches and grooves. Effects of corners, sharp angles, and notches are much less with gray iron than with any other structural material. The usual endurance ratio determined on unnotched bars for gray iron is about 50 per cent, although some report endurance ratios as high as 80 per cent. Thus, the success of cast cam and crank shafts not only is due to the power of gray iron to damp out vibration, but it also is dependent upon the high endurance limit and low notch-sensitivity of gray iron.

Are Made Agents

Foote Bros. Gear Machine Corp., Chicago, has appointed the following representatives: A. C. Andrews, 1613 Bryan street, Dallas, Tex., in the northern half of Texas; W. M. Lee, 1409 California avenue, Houston, Tex., in the Houston territory; and the Industrial Engineering Co., Professional building, Charleston, W. Va., in the southern part of West Virginia.

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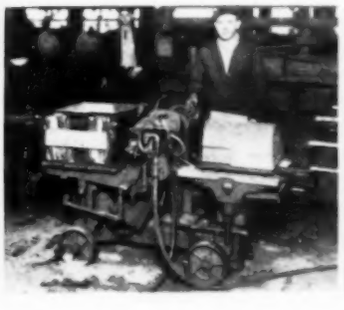


"Specs"

(*Continued from page 29*)

sidering the merits of any particular steel making process.

Those who feel this way thought at the time, and still think, that it would have been better for the society to confine itself to prescribing *what* should be the properties of the castings in question, adopting as rigorous requirements as any one could demand fairly, and leave it to the makers *how* the specifications should be met. If the consumers had chosen in placing their orders, to restrict their purchases to foundries using only the electric and open hearth processes, or even had they wished expressly to forbid converter steel in their inquiries, they could have indulged their individual prejudices against the converter, without putting foundries using the converter in the position of having their product condemned in advance as unfit for the requirements of really severe service.

Their difficulty, of course, lay in the fact that they were unable to include requirements in their specifications that they knew converter steel would not meet, and they were driven to the expedient of condemning the process *per se*, since they could not bar out its product on the basis of any tests they could think of. Before the advent of fused soda ash treatment of the iron in the ladle to reduce the sulphur content before charging the metal into the converter, the sulphur in converter steel was generally quite high, so that a low limit on that element in specifications served as a bar to the use of the process.

Steel Compares Favorably

However, treatment with fused soda ash enables the converter operator to keep his sulphur within any desired limits, and of course the other elements in carbon steel are controlled readily in converter operation. Physical properties of converter steel as disclosed by the usually prescribed tests, commonly are as good as those of steel made by other processes, microscopic examination for nonmetallic inclusions generally shows the steel to be of good quality, and soundness as revealed by radiographic examination is of course determined by foundry practice, rather than by steel making methods.

The claim was made that performance of converter castings in service had been unsatisfactory, but no very clear case was made out for this contention, chiefly because the converter had been condemned in advance and few fittings made by that process ever had been installed in high temperature service. Naturally, too, service performance could not be included in purchase specification, so there was nothing for it but the absolute barring of the process under the wording, *The steel shall be made by the open hearth, electric-furnace, or other process approved by the purchaser*. Nominally, of course, this does not bar other processes absolutely, but it puts them in the position of the defendant under French law,—guilty unless proved innocent.

Not so much space would be given to this old controversy in an article on specifications, were it not for the light it throws on the moot question of prescribing *how* as well as *what* in specifications, and some of the long-range results of the wide condemnation of the converter process that ensued upon the adoption of the restrictive clauses which have been discussed. It is common gossip in the industry that certain low-alloy castings for government requirements were made for several years of converter steel, met all tests successfully, and gave satisfactory service, though the specifications under which they were made called for open hearth or electric-furnace steel only.

Confine the Specifications

No adequate reason existed for barring the converter process in the case of low-alloy steels that can be made by that method, but the general back-stairs gossip of the inferiority of converter metal led to its exclusion from these specifications, just on general principles. No more powerful case could be made out for the point of view that says "Make your restrictions as severe as you want them, but confine specifications to properties desired, and do not say how those properties shall be obtained."

A curious side-light on this question is shed by the history of *Recommended Practices* of one sort and another in the A. S. T. M. In the early days of the society, a committee was formed whose function was to promulgate recommended practices for various heat treatments. Its membership consisted chiefly of men of recognized standing in the heat treatment field.

The Producers group in the society was always hostile to the committee, sometimes covertly, sometimes openly, basing their opposition on the ground that it was not the function of the A. S. T. M. to prescribe how products should be made, and that *Recommended Practices* were but a thinly-disguised form of *How* specifications. They feared that their customers would include in their requirements a clause saying that such-and-such an A. S. T. M. recommended practice should be followed in the production of the materials called for.

Even the adoption of a clause printed immediately under the title, specifically stating that these recommended practices were not to be considered as in any way a part of any A. S. T. M. specification, did not wholly allay the opposition to them, and they gradually fell into disuse and disrepute. Some years ago they were formally withdrawn, leaving to the American Society for Metals and task of drawing recommended practices.

That society, however, has always followed the procedure of having its recommended practices drawn up by small committees, and O.K'd by a handbook committee that has to cover an enormous amount of ground and is unable to give each recommended practice the detailed attention it should have. As a result, A. S. M. recommended practices sometimes have represented to too great an extent the individual opinions of certain members, occasionally of rather extreme views, and have not the authority that the slower but more certain methods of the A. S. T. M. give.

Clauses Unduly Restrictive

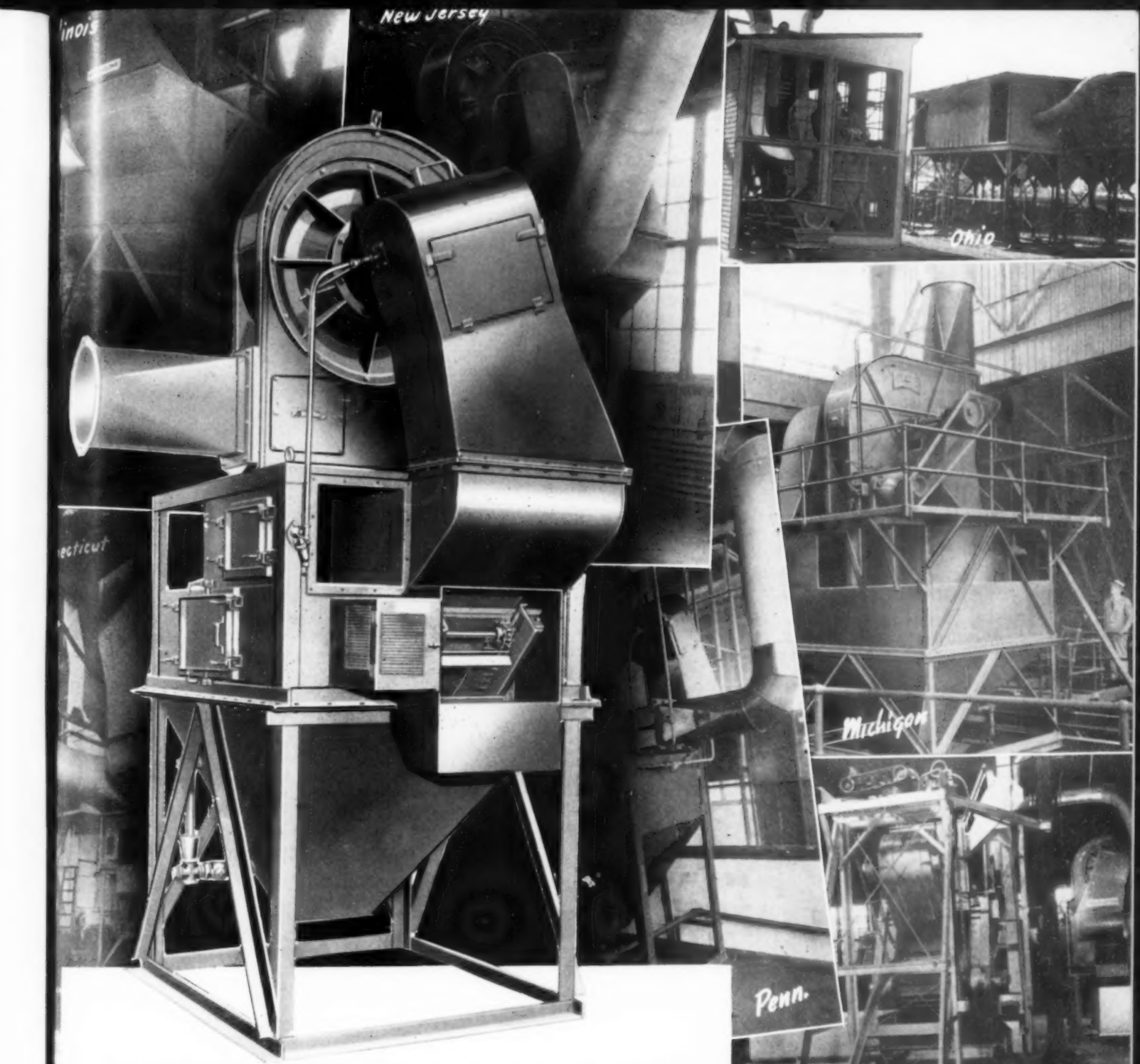
Certain specification-writing bodies have adopted *how* clauses in heat treatment that tend to be unduly restrictive. This is especially true of the government specifications, as the summaries show. Thus QQS681a and 49S1i restrict the maker to full annealing, or normalizing in certain cases, and do not allow quenching in a liquid medium at all. The A. A. R. follows suit in its specification M201-36, and A. R. E. A. goes it one better, and allows only full annealing.

There is, of course, a certain justification for this in the government specifications, as far as castings for high pressure or high temperature service are concerned, since it is now well known that quenched and drawn castings do not have as good resistance to creep as annealed or normalized material. However, this, could be taken care of easily by confining the prohibition of liquid quenching to castings for that class of service, and leave the maker free to use quenching if he so desires.

There is not the slightest doubt that quenching and drawing gives cast steel the best possible combination of physical properties for many kinds of service, and the prohibition of this treatment is undoubtedly a *how* clause, pure and simple. There are a number of foundries competent to handle any type of heat treatment of cast steel, with suitable equipment and staffs quite competent to prescribe the treatment most suited to secure the best possible casting.

It seems as if these shops should be allowed to treat their castings

(*Concluded on page 82*)



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(*Concluded from page 80*)

so as to give them the maximum strength and toughness, without being hampered by *how* clauses in specifications, whose only object is to prevent inexperienced foundries from attempting to quench and draw jobs that it would be dangerous to treat in this manner. Of course, the stumbling block is the fact that it is difficult if not impossible to devise tests that will locate surely the incipient cracks that may be produced by quenching castings not suitable for this treatment, or in a manner not correct to avoid damage.

Even radiographic examination will not surely locate very small fissures, and radiography, of course, is expensive. Until a larger number of concerns are equipped and staffed to carry out these more difficult heat treatments properly, perhaps these restrictive *how* clauses are justifiable, but it seems a pity that they have to be included.

Govern Method of Procedure

The successor to the unpopular recommended practices in A. S. T. M. specifications, mentioned previously, is the specification with *how* clauses in heat treatment similar to those that have just been discussed. This is illustrated in the carefully worded clauses in specification A27-36T and A87-36 prescribing the methods that shall be followed when quenching and drawing are permitted. These clauses either specifically require that the quenching shall be preceded by normalizing or annealing, or refer to the quenching as a *supplementary* treatment, thus clearly indicating that some previous treatment is required.

In many cases, of course, it is desirable or even essential that preliminary normalizing or annealing should precede a second heating for quenching, since cleaning, chipping and welding generally are necessary, and the green casting may crack in the cleaning room if not first annealed or normalized. Then, too, welding after final heat treatment not being desirable, the quench and draw often should follow a preliminary stress-removing anneal or normalize.

However, there are, numerous cases in which quenching safely and desirably may follow the first heating above the critical range, provided time at the high heat is allowed for the ingot structure of the cast steel to be broken up. To heat the steel for several hours at 1650 degrees Fahr. quench, and draw at 1200 to 1250 degrees Fahr., effectively breaks up the cast structure, gives excellent physical properties, and the grain size is little if any larger than would be obtained if the steel were cooled in air or furnace from 1650 degrees Fahr., and then heated again to 1500 degrees Fahr. for quenching.

Theoretically the latter procedure should give a slightly finer grain and somewhat better physical properties. Practically, however, in the majority of cases it is doubtful if the gain is worth the cost. Why then insist in specifications that heating and quenching follow a preliminary anneal or normalize, or be a *supplementary* heat treatment, which amounts to the same thing? The first American concern to adopt quenching and drawing as a regular practice used the simpler heat treatment for years with complete success for castings that went into exceedingly severe service, if any further proof were needed that this *how* clause is sometimes unduly restrictive.

Restrictions on chemical composition are another point on which lively differences of opinion arise from time to time. Phosphorus and sulphur, the one tending to brittleness at atmospheric temperature, the other producing weakness at high temperature and as a consequence leading to the formation of hot tears in castings, generally are recognized as fair ground for restriction, and there is little argument over the phosphorus and sulphur clauses in standard specifications.

Unanimity Is Lacking

Silicon is another matter, as when used within ordinary limits its influence on physical properties is slight. However, it has a strong influence in promoting soundness, so that the producer always has felt it should be left to him how much silicon to use in his steel. the summary of specifications—pages 83 and 84 in the January issue of THE FOUNDRY—shows at a glance that most of the specification-writing bodies take this view, while the government agencies include maximum silicon limits for certain classes, with no unanimity of opinion as yet as to the exact permissible maximum.

Classes 1 and 2, in specification QQS681a, in which silicon is limited are those intended for fabrication by welding, or welding to, in erection or service. Class 1, which is for cases where stress-relieving after welding is impracticable, allows higher silicon (0.50 per cent), than class 2, for cases where stress relieving can be carried out, which allows 0.45 per cent. The requirements of the navy specification, 49S1i are similar since this particular specification is now undergoing revision to bring its provisions practically into line with those of QQS681a, extended comment on its terms here are not desirable.

This same pair of steels in QQS681a has restrictions also on copper, nickel and "other elements," as wells as on carbon and manganese, all with a view to reducing possible weakness or brittleness after welding. A committee of the A.S.T.M. now is wrestling with the problem of developing specifications for cast steel valves, flanges and fittings for high temperature service, suitable for assembling by fusion welding.

The committee has made a great effort to obtain authoritative information as to the influence upon the properties after welding of the usual metalloids, as well as that of the small amounts of copper, nickel, molybdenum, chromium, etc., now unavoidably present in steel because of the contamination of our scrap supply with alloy steel scrap. So far, not much worthwhile information is forthcoming. In view of this dearth of real knowledge on this point, the attempt to limit makers to definite amounts of these elements necessitates a lot of pure guess-work.

Why castings that can not be stress relieved after welding may contain silicon up to 0.50 per cent maximum, while those that can be stress relieved are allowed only 0.45 per cent, is one of the mysteries. There is better reason for the higher allowable nickel and copper content in class 2 than in class 1, in view of the known hardening effect of these elements, especially in combination with carbon and manganese.

Grinding Wheels

Standing committee in charge of simplified practice recommendation R45, grinding wheels, has approved a revision of the recommendation which lists the recommended sizes of each of the nine standard types of grinding wheels. The items listed are representive of practically all grinding wheels used on the standard makes of grinding machines. This fourth revision brings the recommendation into line with present day requirements; eliminating some varieties which have fallen into disuse since the 1932 edition, and adding others which lately have come into demand. Mimeographed copies of the proposed revision may be obtained from the division of simplified practice, National bureau of standards, Washington.

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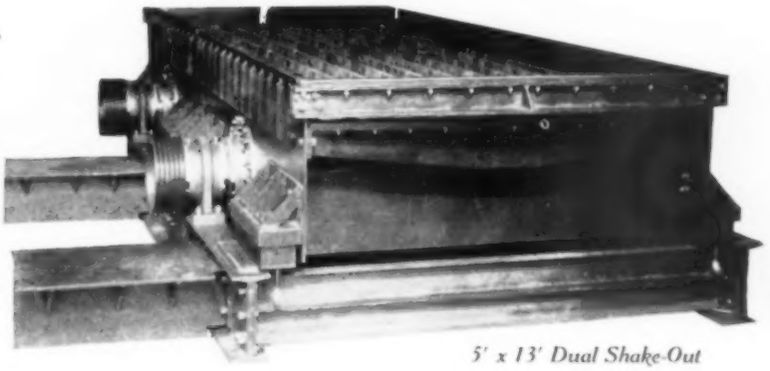

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Wide Range Of Alloys Available

(*Continued from page* 30)

and, therefore, is more satisfactory for gear purposes and some bearings; but since the delta constituent is more pronounced, the tendency to leak at the junction of heavy and light sections may be more noticeable unless the castings have been annealed so as to reabsorb this delta constituent. This is a composition that has had favorable application for many years in a wide variety of different types of service. Just why it has been so popular is only explained by the fact that it has had much publicity and is a relatively simple alloy to cast.

The federal specifications permit both phosphorus and nickel as above noted for composition *FF*, but they are not required and are not very often found to be present in the true alloy 88-10-2. A little nickel added to this material does tend to refine the grain and to some extent increase the density of the cast material. As above noted the presence of phosphorus in the zinc-deoxidized bronze is debated. There are two schools; one holding that the zinc-deoxidized bronze should not have phosphorus, and the other permitting a trace of phosphorus.

Composition *HH* is a true phosphor bronze not necessarily requiring the presence of phosphorus in the final resulting composition. It is only necessary that sufficient phosphorus be used to deoxidize the material properly during the process of manufacture. It is a true bronze since it contains only copper and tin. It contains enough tin to give good hardness and to develop a sufficient amount of the secondary or delta constituent so that this bronze will be a good bearing metal for types of service where lubrication is well provided. Since there is no lead present in this alloy, lubrication must be assured. This alloy is used quite commonly for some types of bearings, gears and the like, and for castings subject to the corrosive action of some acids, that would attack bronzes containing zinc or other materials and, therefore, necessarily must be absent.

Worm Gear Bronze

Composition II containing 89 per cent copper, 11 per cent tin with a trace of phosphorus to be expected, is the standard worm gear bronze. This is covered by specification S.A.E. 65. This bronze is widely used in the production of worm gears cast by the chill cast process or centrifugal process, as well as cast in sand in the regular way. Phosphorus up to 0.25 per cent is not uncommon and in some instances an even higher percentage of phosphorus is specified to meet certain conditions.

This bronze properly cast develops an excellent bearing value since it has an ample amount of the secondary delta constituent present to support the loads. It has very satisfactory physical properties for the resistance to wear under properly lubricated conditions, as in bearings, gears and the like. With the addition of up to ¼ per cent nickel, this bronze also has been used for worm gear service, although the addition of nickel without the addition of some lead has been debated to some extent.

Composition *JJ* is essentially composition *II* with 1½ per cent nickel substituted for a like amount of copper. This composition is used frequently for worm gears subject to heavy duty and for some types of bearings where satisfactory lubrication is assured. Composition *KK* is a zinc deoxidized bronze having a relatively high percentage of tin present which gives it considerable hardness.

Composition *LL* is much like composition *KK* except that the zinc content is higher and in consequence the copper tin is lower. The tin also has been increased from 13 to 13½ per cent thus hardening the alloy as compared with the previous one. This alloy has been known as naval journal bronze and was covered by the old Navy specification 46B9c.

Composition *MM* is one of the bell metals. It will be noted that the composition lists 1 per cent phosphorus maximum, and 0.25 per cent zinc maximum. Both of these materials are established at their maximum permissible limits and are not necessarily required to be present, it being a simple requirement that the alloy shall be a true copper-tin alloy properly deoxidized. If this bronze is to be used for bells, neither zinc nor phosphorus are desirable constituents in the final alloy, if the best tone is to be secured.

However, to make a sound metal, some deoxidizing agent must be used to reduce the copper oxide, and the usual practice is to use a very small amount of phosphorus. The attempt is made to use just enough to deoxidize properly and yet have none in the final resulting material.

(*Concluded on page* 86)

Table III

Compositions of and Other Data on Nonferrous Alloys

No.	Copper	Tin	Lead	Zinc	Nickel	Phosphorus	Pouring Temp. Deg. Fahr.	Melting Point Deg. Fahr.	Specifications A.S.T.M.	S.A.E	FED.
EE	94.7	5	....	....	....	0.3	1920–2200	1650–1730	.....	..	.....
FF	88	8	....	4	....	....	1920–2200	1650–1730	B 60-36	..	QQB 691a (5)
GG	88	10	....	2	....	....	1920–2200	1650–1730	B 22-36T (d)	62	.....
HH	90	10	....	....	....	trace	1920–2200	1650–1730	.....	..	.....
II	89	11	....	....	....	trace	1920–2200	1650–1730	.....	65	.....
JJ	87.5	11	....	....	1.5	trace	1920–2200	1650–1730	B 22-21D	..	.....
KK	85	13	....	2	....	....	1920–2200	1650–1730	.....	..	.....
LL	83	13.5	....	3.5	....	....	1920–2200	1650–1730	.....	..	.....
MM	81	17	....	0.25 max.	....	1 max.	1920–2200	1650–1730	B 22-36T (b)	..	.....
NN	80	20	....	0.25 max.	....	1 max.	1920–2200	1650–1730	B 22-36T (a)	..	QQB 691 (10)
OO	92.5	7	....	....	....	0.3	1920–2200	1650–1730	.....	..	.....
PP	84	10	2.5	....	3.5	....	.....	.....	.....	..	.....
QQ	85	10	5	....	....	....	.....	.....	.....	..	.....
RR	88.75	6	1.75	3.5	....	....	1920–2200	1650–1730	B 30-36 (1)	..	QQB 691 (a) 1
SS	88	6.5	1.5	4	....	....	1920–2200	1650–1730	B 30-36 (1)	..	QQB 691 (a) 1
TT	87	7	3	3	....	....	1920–2200	1650–1730	B 30-36 (6)	..	.....
UU	86	8	2	4	....	....	1920–2200	1650–1730	B 30-36 (3)	..	.....
VV	88	10	2	....	....	trace	1920–2200	1650–1730	.....	63	.....
WW	86	10	2	2	....	....	1920–2200	1650–1730	B 30-36 (2)	..	.....
XX	86.5	11	0.5	2	....	....	1920–2200	1650–1730	.....	..	.....
YY	86.5	11	1.25	....	1	0.25	1920–2200	1650–1730	.....	..	.....
ZZ	83	14	1	2	....	....	1920–2200	1650–1730	.....	..	.....

Gray Cast Iron

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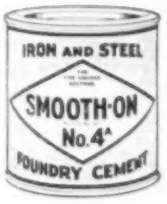

THOSE few castings which come out of the molds with harmless but unsightly surface pits and rough depressions should always be corrected to perfect contour, and as the cost of filling is but the smallest fraction of the value of the finished casting, you can't afford to use any filling material but the best.

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(*Concluded from page* 84)

This is a hard copper-tin bronze commonly used for heavy duty bearings, such as bushings in bascule bridges and some gears and other types of service where wear resistance is required and good lubricating conditions provided. This alloy is covered by A.S.T.M. specification B22-36T(b).

Composition *NN* is the standard bell metal, 80 per cent copper, 20 per cent tin, but as indicated in Table III, 0.25 per cent zinc maximum is permissible and 1 per cent phosphorus is p e r m i s s i b l e, but neither are required. In fact, they are definitely detrimental when the material is to be used in the production of the best bells. This material is covered by specifications A.S.T.M. B 22-36T (a) and QQB 691a (10) of the federal specification board. It will be noted that the federal specifications permit a maximum of only 0.60 per cent phosphorus and require a minimum of 0.40 per cent phosphorus. They also permit a maximum of 0.75 per cent nickel, but do not require any nickel to be present. Presence of iron is limited to the maximum of 0.10 per cent and lead to the maximum of 0.50 per cent. These specifications are for this composition when it is to be used for the naval service, which comprises heavy duty bearings and bushings, turntable bearings and the like. In the American Railway Engineering association's specification, this composition is designated as grade *A*, as follows: Copper, remainder; tin, 20 per cent maximum; phosphorus, 1.0 per cent maximum; other elements, 0.05 per cent maximum; elastic limit in compression, 24,000 pounds per square inch minimum; permanent set under 100,000 pounds per square inch, 0.06-inch minimum and 0.10-inch maximum; permanent set under 50,000 pounds per square inch, to be recorded.

It is indicated that this composition shall be used for contact with hardened steel disks under pressures exceeding 1500 pounds per square inch, such as are used in turntables and center bearing swing bridges. The same association recognizes composition *MM* for contact with soft steel at low speeds under pressures not exceeding 1500 pounds per square inch, such as trunnion and journals of bascule or lift bridges.

Composition *OO* is essentially 93 per cent copper, 7 per cent tin with some phosphorus present; the copper hardened with tin as in the instance of composition *EE* but somewhat harder by reason of the increase in tin. This is an excellent material from which to make castings that are to be coined later to some extent to give a sharpness of outline to design. It casts well, since it is very fluid at the proper pouring temperature. It is used frequently for ornamental work that needs an alloy that will run into sharp corners and follow intricate patterns with a minimum amount of trouble. It is soft enough to tool readily and yet hard enough to hold such fine work after it has been completed and resist the destructive wear on such nice ornamental surfaces. It makes an excellent material for handsome signs and labels that are to be cast and later tooled to a fine ornamental appearance.

This is the third of a series of articles on nonferrous alloys available for foundry use. Previous articles appeared in the January and February issues, and a fourth will appear in one of the forthcoming issue. The Editors.

Book Review

Pattern Making, by James Ritchey, cloth, 233 pages 5 x 8 inches, published by American Technical society and supplied by THE FOUNDRY, Cleveland for $2.00; and in Europe by the Penton Publishing Co., London.

Originally prepared by James Ritchey several years ago, the book has been revised and brought up to date by Walter M. Munroe, instructor in patternmaking, Worcester Polytechnic institute, Worcester, Mass.; by Charles W. Beese, head, department of general engineering, Purdue university, Lafayette, Ind., and foundry industrial engineer, Armstrong Cork Co., and head, department of industrial engineering, Pennsylvania state college, State College, Pa.; and by Philip Ray Hall, assistant professor of industrial engineering, Pennsylvania State college.

The work reflects the background of the original author and the revisors who have had exceptional experience not only in practical work but also in teaching the subject for many years. Practically every feature involved in the construction of wood and metal patterns for use in the foundry are covered under the following headings: Practical requirements, working mediums, hand cutting tools, measuring tools, small tools, machine tools, molding practice, typical patterns, metal pattern making. The book is profusely illustrated with 350 figures and carries an index in addition to a detailed contents page.

"Harmful Industrial Dusts" is the title of a 12-page bulletin issued by the Public Health service, treasury department, Washington, which may be obtained for 5 cents.

Table IV

Physical Properties of Various Nonferrous Alloys

	Tensile Strength	Yield Point	Elongation Per Cent	Compression: Of 0.001-inch	Compression: Inches at 100,000 lb. sq. in.	Brinell Hardness	Weight Pounds Per cu. in.
EE	37,250	16,000	27	.....	.....	63	0.305
FF	43,000–48,000	18,000–20,000	35–48	.....	.....	70	0.314
GG	38,000–47,000	18,000–22,000	18–30	.....	.....	65–80	0.313
HH	35,000	18,000	15	.....	.....	.....	0.314
II	30,000–44,000	23,000–26,000	4–8	.....	.....	75–85	0.310
JJ	45,000–50,000	25,000–27,000	15–20	.....	.....	85–95	0.320
KK	38,000	.....	1–8	.....	.....	.....	.....
LL	25,000–32,000	13,000–15,000	2–4	.....	.....	55–65	0.310
MM	25,000–32,000	19,000–27,000	1–1.5	.....	.....	70–80	0.310
NN	26,000–33,000	18,000–21,000	0.5	24–28,000	0.06–0.10	130–143	0.314
OO	30,000	18,000	15	.....	.....	60	0.313
PP	45,000–60,000	27,000–32,000	7–20	20–24,000	0.20–0.25	80–93	0.318
QQ	40,000–50,000	20,000–23,000	15–30	13–14,000	0.20–0.25	55–72	0.314
RR	34,000	16,000	22	.....	.....	.....	0.314
SS	40,000	17,000	25	.....	.....	55	0.314
TT	34,000	18,000	14	.....	.....	60	0.322
UU	30,000–36,000	.....	25–30	.....	.....	55–65	0.310
VV	45,000–57,000	22,000–26,000	15–40	15–17,000	0.23–0.28	60–75	0.316
WW	30,000–40,000	18,000–19,000	15–25	12–14,000	0.28–0.32	52–65	0.310
XX	35 000–40,000	16.000–18,000	9	.....	.....	60–65	0.310
YY	33,000	16,000	10	.....	.....	90	0.315
ZZ	23,000–27,000	15,000–19,000	4	.....	.....	.....	0.312

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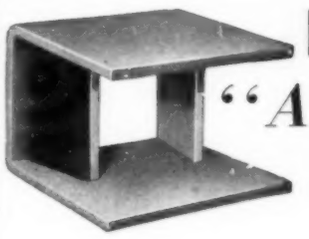

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Castings Established As Valuable Materials

(*Continued from page* 33)

quality of production and increasing production efficiency. This movement has been developed under the auspices of the Steel Founders' Society of America. These regional groups of operators have been active as may be demonstrated by the fact that the experimental work of Sims and Dahle on the use of aluminum was checked on a commercial scale and proved correct by the operators of the Eastern group.

There is a considerable broadening of the market on composite welded structures, and steel castings are being extended to many new applications. In this regard engineers of the Ford Motor Co. have announced that the utilization of steel castings has been extended in that organization so that now 149 pounds of steel castings are used in every car.

Foundrymen To Consider Elevated Temperatures

By JOHN W. BOLTON
Chief Metallurgist
Lunkenheimer Co., Cincinnati

TEMPERATURES, already high in the petroleum refining processes, are being increased also in central power stations. Steam is handled at 950 degrees Fahr. at pressures ranging up to 1500 pounds per square inch.

Castings and other metals used to handle high temperature, high pressure fluids must not alone be sound and uniform and possess good properties at room temperature. They also must have resistance to *creep* or *flow* at elevated temperatures, retain toughness, and above all be stable, not subject to structural deterioration induced by long time exposure to elevated temperatures. In the structural assembly of castings to other metal products, welding is being more widely used, and amenability to welding without formation of zones of low ductility or high hardness is required.

Careful studies are required to ascertain the suitability of various metals. Available creep data is covered rather well by the creep data volume, published jointly by the A.S.T.M. and the A.S.M.E. Study of these data impresses one with the fact that there are wide variations in creep strength with given normal compositions, and even closely alike room temperature properties. These differences, perhaps more noticeable in the wrought metals, are traceable to differences in manufacturing history, such as melting media, deoxidation practices, heat treatment, and the like.

These matters are being studied by the A.S.T.M.-A.S.M.E. joint research committee on the effects of temperature on the properties of metals and by several individual agencies. It behooves foundrymen to keep in close touch with this work. Various regulatory bodies are faced with the necessity of drawing up codes limiting applications of these materials. In some cases codes may be found to be unduly restrictive or very costly to comply with. This is especially the case where the regulatory body does not have sufficient data and facts to go on and must properly lean toward great conservativeness. Not only should the foundryman keep informed so that he can comply with newer requirements and perhaps modify or develop his product to better meet conditions. He also should back research and study which establishes more clearly the range of utility of known products and is suggestive as to how to improve his product. Naturally such backing should not only be moral, but financial. Money is needed.

While the higher temperature applications are being served with ferrous applications, there is a dearth of sound information on nonferrous products, both cast and wrought. These products are being more carefully scrutinized by purchasers, and it is up to the producers to give them information.

Gray Iron Industry Makes Metallurgical Progress

By A. C. DENISON
President
Fulton Foundry & Machine Co., Cleveland

IT IS rather difficult to look back and say what is the outstanding progress made in the gray iron casting business during the year, but as I reflect about it in the medium and heavy casting field it does seem one phase has seen definite progress. It is metallurgical.

There is a keener understanding by the buyer of castings and the producer of castings regarding the physical and metallurgical requirements and possibilities of gray iron castings so that castings are being produced to meet the job as they have never been made before. They are tailor made, so to speak. No longer does a good foundry just make a routine gray iron for all their products.

For example a good jobbing foundry may classify and market their iron castings in somewhat the classifications that are below.

1. *Plain gray iron* for ordinary routine applications where form is more important than specific properties and price is a major consideration.

2. *High strength gray iron* made for general engineering applications where definite specifications must be met according to the requirements of the job. Applications to require not only high tensile strength but good resilience, good impact, and good fatigue properties.

3. *Casting for best heat treating properties* where the entire casting is to be hardened by quenching and drawing or where flame hardening is to be practiced and definite results are desired in good hardness ranges.

4. *Wear resistant castings* made according to the requirements of the job. These can be made in ranges from 260 to 450 brinell hardness.

5. *Heat resistant castings* made for best service performance in certain heat ranges.

6. *Corrosion resistant castings* where conditions warrant something better than conventional gray iron.

It has taken the experience of years to obtain a dependable understanding of foundry metallurgy to know how to produce irons for such definite classifications of service as previously outlined. But, I believe it is being recognized generally by an increasing number of engineers and users of castings that progressive iron foundries have acquired the experience and metallurgical background to produce good serviceable castings for this particular range of service and that the experimental period is now pretty well over.

Give Close Attention to Control of Sand

By H. W. DIETERT
President
Harry W. Dietert Co., Detroit

THE foundry industry exhibited a marked trend toward incorporating testing equipment to enable the personnel to control purchase and processing of materials used. Of particular note is the forward step made in controlling physical properties of molding materials exactly. This trend toward placing the foundry on a scientific basis and departing from the rule of thumb method is doing much to place castings on the preferred list for machine parts.

Most foundries, whether large or small, now have sand testing equipment to measure the moisture, permeability, green strength, dry strength and mold hardness of the

(*Concluded on page* 91)

ADVERTISING PAGES REMOVED

(*Concluded from page* 88)

sands. The larger foundries have additional equipment necessary for determining the clay content and fineness of their sands.

The savings secured by instituting sand control in a medium size foundry under the present production rate is averaging substantially $5000 per year. This saving is secured in the reduction of raw materials used, in improved sand condition which avoids delay in molding and in the reduction of scrap castings.

Synthetic sand, compounded from silica sand and bonding clay or bentonite, heretofore was limited to sand for molding heavy and medium weight castings. This past year marks the entrance of synthetic sand for light weight castings where a sand with a permeability of 30 to 40 is required.

Testing molding sand and cores at elevated temperatures, corresponding to temperatures at which the metal is poured, has advanced this past year. Several laboratories are now equipped with equipment to measure expansion, contraction, hot strength and rate of core breakdown at elevated temperatures.

The future work in advancing sand and core testing will be largely in high temperature testing. From this work better molding materials will be developed.

Cast Ferrous Materials Use Extends Into New Fields

By R. G. McELWEE

Foundry Engineer
Vanadium Corp. of America, Detroit

AT NO time in the history of the foundry industry has there been so much evidence of an honest search for quality methods as at the present time. Improvements in melting processes and closer control of existing methods are contributing to extend the use of cast ferrous materials into new fields. Engineers are benefiting by having available the properties they require with a manufacturing method both elastic and economical. Of course, this involved the need for higher trained men for key positions in the industry.

THE FOUNDRY regrets sufficient space is not available to reproduce all of the interesting comments, which were received originally by *Steel* for the Yearbook of Industry issue.

The Editors.

Malleable Society Has A New Activity

MALLEABLE Founders' society, Cleveland, recently has appointed James L. Cawthon Jr., as development engineer, according to an announcement of Robert E. Belt, secretary-treasurer. This new activity of the society will supply technical data to users of malleable castings, will engineer new uses for malleable and will give other services to users and society members under the head of general product engineering.

This addition to an already extensive list of services maintained by the malleable society, many of which are of long standing, is indicative in a typical manner, of the organization's preached and practiced belief in the advantage and benefit, to its clientele and therefore to itself, of intelligent co-operative activity within an industry. For upwards of 20 years and acting in accordance with the principle, "He profits most who serves best," activities of the society have been directed, consciously and in major part, to the end of safeguarding and promoting the interest of the purchaser of the industry's product. Much of the work of the society exemplifies the idea of "intelligent selfishness" in action and demonstrates its wisdom and efficacy.

That the policies of the association have concerned themselves vitally with the interests of the users of its product, is well attested by the evolution and development of specifications covering malleable iron castings. Comparison of important elements of the original and the present A.S.T.M. specifications reveals almost unbelievable improvements. For example, the first A.S.T.M. specification stipulated an elongation of not less than 2.5 per cent in 2 inches. Grade 35018 malleable iron, under present specifications, must have an elongation of 18 per cent minimum.

This is a difference in degree, which in most analogous instances, would constitute or indicate a difference in kind. It is arresting to realize that a given material could undergo improvement to the extent of an increase of 620 per cent in even one highly desirable and essential characteristic, and still remain the same material, basically. Yet such is the case; and in the whole period of the existence of A.S.T.M. specifications for malleable iron, there has been no single instance in which any consumer has attempted to have the specifications raised. Each increase in quality and utility, that step by step, has brought these specifications to their present exacting level, has been the result of voluntary and co-operative action by the industry's trade association.

Co-operative activities of the Malleable Founders' society are conducted by its officers, directors, nine primary or standing committees and the society's full-time staff. Policies are determined and set by a board of directors of 12, chosen from the executives of member companies. Primary committees also are chosen from member personnel of executive rank, and work under the supervision of, and report to, the directors.

Maintain Large Staff

Committees having duties and responsibilities of interest to the industry's clientele are those on research, development and new uses, specifications, technical council, and special irons. With committee direction and collaboration, members of the staff carry on their respective activities. In this staff are included a consulting engineer, shop practice engineer, development engineer and the necessary clerical and secretarial personnel.

Enrique Touceda, professor of metallurgy, Rensselaer Polytechnic institute, author of numerous contributions to the literature of iron and steel metallurgy, and one of the outstanding metallurgical authorities of the world, is consulting engineer to the society. His duties include a wide range of consultative work, among which are: plant visitation; attendance at shop practice conferences; supervision of testing of product selected at random from members' production by the shop practice engineer; counsel to members on technical matters concerning production and users' requirements; review of technical literature and keeping members advised of new developments relative to their product and production; and representation of the society in co-operative work undertaken with other technical organizations.

James H. Lansing, shop practice engineer, has been engaged in the malleable iron industry in technical, production and executive capacities for the past 20 years. Mr. Lansing's activities are mainly in connection with maintaining quality standards. Among them are numbered: Regu-

lar, periodic visits to works of society members; assistance in production problems and keeping up and improving quality of product; random selection of test specimens for examination and report by the consulting engineer's laboratory; direction and conducting shop practice conferences held quarterly in each of the eight membership groups; shop practice reports to members after conferences; periodic inspection of practice and of finished product in works of members.

James L. Cawthon, Jr., newly appointed development engineer has been identified with the iron, steel and foundry industries for the past 19 years. His experience has included engineering, production, sales and advertising, and executive activities. He has been associated with Pittsburgh Electric Furnace Corp., General Motors Corp., the Bonney-Floyd Co., American Steel Foundries and Continental Steel Foundries. In addition to general duties listed above, he will also carry on the society's co-operative educations work with technical schools in the country.

In addition to routine duties of the staff members, each year, certain of the standing committees designate "special current projects" for exhaustive investigation by the appropriate staff member. These detailed studies have covered such subjects as annealing practice, short anneal and pearlitic malleable iron, and the impact testing of malleable. Reliable, first hand and directly applicable data are, in this manner, made available to member foundries.

Many of these projects are quite long-range and far-sighted in their viewpoint, it being realized clearly by the members of the Malleable Founders' society that they must serve their market adequately today, and be ready to serve it adequately a number of years hence, if that market is to be held and expanded.

Study Problems in Steel Foundry

Unnecessary latent physical values in steel castings would represent a staggering figure of waste if they could be computed, K. V. Wheeler, Lebanon Steel Foundry, Lebanon, Pa., told members at a technical session of the Steel Founders Society of America held in Chicago, Feb. 9.

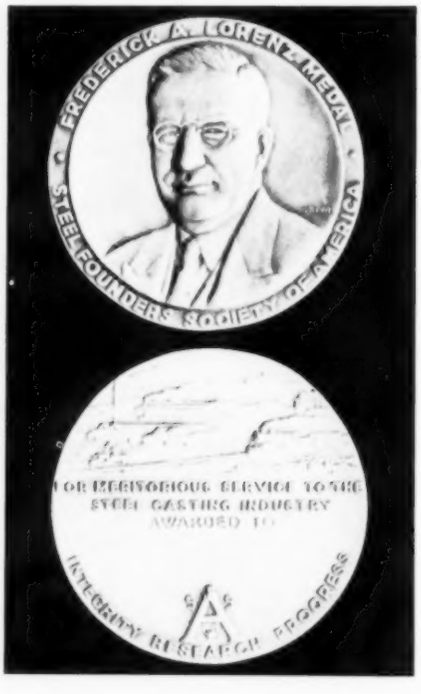
In discussing design factors affecting steel casting production, Mr. Wheeler continued, "The responsibility for this waste rests not alone on the foundrymen, for how many designing engineers actually know the limitations or the possibilities of cast steel in its various compositions and with its wide varieties of physical properties?

"Neither group can hope to master the details of both subjects. We will always need designers and we will always need foundrymen, but closer work on each job as it comes up will help place the inherent strength and toughness of cast steel in those members where it is most vitally needed and will reduce much of the superfluous metal and weight."

One slide of particular interest shown by Mr. Wheeler illustrated where the production of the steel foundry is used. Railroads and transportation acounted for approximately 35 per cent, machinery and tools 25 per cent, rolling mills 15 per cent, materials handling equipment 8 per cent, valves and fittings 7 per cent, roads and building construction 5 per cent, and unclassified 5 per cent.

The second feature of the session was a report prepared by the operative executive group No. 1 on "Aluminum Additions and Their Effect on the Properties of Cast Steel", which was read by Lee C. Wilson, Reading Steel Castings Division, American Chain & Cable Co., Reading, Pa.

An early theory that aluminum caused low ductility has been disprover, it was indcated by the report. Early experiments with aluminum additions by co-operating foundries brought varied results but the chief factor stressed in the report was the extreme care necessary in the handling of the aluminum additions. Results in general showed castings with aluminum additions to have good welding and machineability characteristics and shrinkage which is not excessive. It was stressed that the aluminum is not added to mold but is put in the ladle.



Concluding paper of the session was "Some Data on the Fluidity of Cast Metals", which was presented by the session's chairman, Charles W. Briggs, technical advisor, Steel Founders Society of America. "The status of fluidity testing of cast steel," he said, "appears to be a mass of incoherent data mostly on iron carbon alloys and other iron alloys that exist in the rimming or semi-killed state in the cast condition."

Fluidity of metals, it was pointed out, depends on the properties of the metals and also on the variables of testing. Factors involved in fluidity are viscosity, surface tension, surface films, gas content, suspended inclusion and the mode of solidification and crystallization. In reality, Mr. Briggs said, the viscosity of all molten metals is low and is a negligible factor in castings.

At the opening session of the meeting held on Wednesday, Feb. 8 reports of various committees were presented and included those on advertising and trade promotion, cost and accounting, definitions and classifications, extras, handbook, occupational classifications, specifications, and technical and operating. Speakers and their topics included Chauncey Belknap, counsel of the group, "The Steel Foundryman, His Society, and the Law"; Gus W. Dyer, Vanderbilt university, Nashville, Tenn., "Government and Business"; A. M. Andorn, Penn Steel Castings Co., Chester, Pa., "The Economic Outlook as It Appears to Me"; Claude L. Harrell, Sterling Steel Casting Co., East St. Louis, Ill., "A Few Fundamentals of Good Salesmanship for 1939", and Senator E. R. Burke, Nebraska, "National Labor Relations Act".

Mr. Harrell in his talk declared that management and salesmanship must go hand in hand to achieve success. He said, "There are many factors which depend upon the management in order to make efficient selling possible. It does not matter how efficient a sales force a business has, if management does not do its part."

At a luncheon held Thursday noon, the first award of the Fredrick A. Lorenz memorial medal established by the society in honor of the late Fredrick A. Lorenz Jr., was made to Mr. Lorenz' family, Frank M. Robbins, president of the society, made the presentation. Mr. Lorenz had served as president of the Steel Founders' Society of America for 5 years before his death. The medal will be awarded at each annual meeting to a member of the industry adjudged by the directors to have made the greatest contribution toward the industry's advancement in the preceding year.

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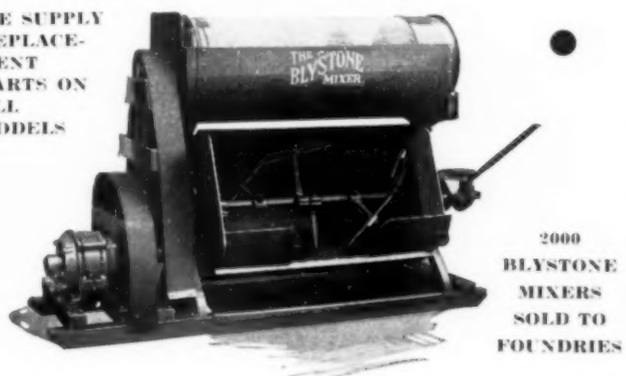

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(*Concluded from page* 42)

Fred B. Skeates, Link-Belt Co., Chicago, "Induction Furnace Practice," by G. F. Landgraf, Lebanon Steel Foundry, Lebanon, Pa.

Nonferrous foundry division will hold a dinner with an outstanding speaker on a nontechnical subject. In addition the division will hold its regular roundtable luncheon, and three technical and shop practice sessions. Some papers scheduled are: "High Conductivity Castings," by A. B. Kinzel, Union Carbide & Carbon Research Laboratories, New York, "Nonferrous Founding," by M. G. Corson, New York, "Crucible Melting," by G. K. Eggleston, Detroit Lubricator Co., Detroit, "Effects of Aluminum on Physical Properties of Red Cast Brass," by H. B. Gardner and C. M. Saeger Jr., bureau of standards, Washington, and "Influence of Pouring Ladles on Quality of Red Brass," by R. W. Parsons, Ohio Brass Co., Mansfield, O.

Discuss Malleable Practice

Malleable division program has been set for the first two days of the convention. Under chairmanship of Lester N. Shannon, Stockham Pipe Fitting Co., Birmingham, Ala., a roundtable discussion will be held following a dinner meeting on the evening of May 15. Papers for other malleable sessions include: "Atmosphere Control in Malleableizing," by John Dow, Holcroft & Co., Detroit, "White Iron for Malleableizing," by J. A. Klein, Texas Foundries Inc., Lufkin, Texas, "Comparison of Grinding and Shearing Gates on Malleable Iron Castings," by S. D. Martin and C. A. Nash, Saginaw Malleable Iron division, General Motors Corp., Saginaw, Mich., "Effects of Manganese on Second Stage Graphitization," by D. P. Forbes, Gunite Foundries, Rockford, Ill., and "Occurrence of Hydrogen in White Cast Iron," by Harry A. Schwartz, National Malleable & Steel Castings Co., Cleveland.

A 4-session shop practice course for gray cast iron is being organized under the chairmanship of P. T. Bancroft, Moline, Ill. Papers for technical sessions are: "Study of Cracked Castings," by L. A. Danse, Cadillac Motor Car Co., Detroit, "Sixty-thousand Pound Cupola Iron," by E. L. Roth, Motor Casting Co., Milwaukee, "Cupola Operation," by John Lowe, Lansing, Mich., "Influence of Undercooling on the Graphite Pattern of Gray Iron," by R. Schneidewind and C. D. Amico, University of Michigan, Ann Arbor, Mich., "Temperature Measurements," by F. Holtby, University of Minnesota, Minneapolis, "Effects of Heat Treatment on Combined Carbon and Physical Properties of cast Iron," by S. C. Massari, Association of Manufacturers of Chilled Car Wheels, Chicago, "Influence of Composition on Electric Furnace Irons," by W. G. McElwee, Vanadium Corp. of America, Detroit, and R. Scheidewind, University of Michigan, "Plastic Cupola Patching," by R. E. Wilke, John Deere Tractor Co., Waterloo, Iowa, and "Risers and a Hot Sand Theory," by M. A. Scott, Greenlee Foundry Co., Chicago.

Sixth Conference at Michigan State

Program for the sixth annual sectional foundry conference sponsored by the Detroit chapter of the A.F.A. and Michigan State college recently has been announced. The meeting will be held at Michigan State college, East Lansing, Mich., April 14 and 15.

The conference will feature a discussion of castability, considering external influences and internal reactions. Arrangements have been made by the papers and program committee, headed by V. A. Crosby, Climax Molybdenum Co., Detroit, as chairman and having the following members: Ira F. Cheney, Griffin Wheel Co.; Harry J. Deutsch, Aluminum Co. of America; Harry W. Dietert, Harry W. Dietert Co.; Fred J. Walls, International Nickel Co.; Fred A. Melmoth, Detroit Steel Castings Co.; Robert E. Kennedy, American Foundrymen's association; and W. L. Cockrell, Michigan State college.

The tentative program is as follows:

Friday, April 14th

8:45 a.m. Registration — Engineering Building.

9:30 a.m. Opening Meeting—address of welcome—John Hannah.

Castability Conference

Factors which affect the casting of metals are considered under two headings (1) External Influences and (2) Internal Reactions.

9:45 a.m. I—External Influences.

A—Mechanical Equipment: Chairman Fred J. Walls, International Nickel Co., Detroit.

(1) Improved Methods of Gating.

(2) Methods of Controlling Directional Solidifications of Metals, by Fred A. Melmoth, Detroit Steel Casting Co., Detroit.

12:30-1:45 p.m. Luncheon—Union Building.

2:00 p.m. I—External Influences.

B—Sand Properties; Chairman—Jesse L. Stoddard, Detroit Testing Laboratory, Detroit.

(1) The Relation of Sand Characteristics to the Shrinkage and Cooling Rates of Gray Iron Castings, by H. L. Womochel and C. C. Sigerfoos, Michigan State college.

(2) A Review of Sand Characteristics on Alloying Additions and Melting Practices on Castability of Aluminum Alloys, by W. E. Sicka, Aluminum Co. of America.

(3) Chill, Strength, Fluidity and Shrinkage Characteristics, by Harry W. Dietert, H. W. Dietert Co., Detroit.

Student Lecture

Subject: "Metal Castings in Industry". Chairman—Harry J. Deutsch, metallurgist, Aluminum Co. of America, Detroit.

4:00 p.m. (1) Cast Iron—Fred J. Walls, International Nickel Co., Detroit.

(2) Nonferrous Castings—O. C. Wheat, Aluminum Co. of America.

(3) Steel Castings—Fred A. Melmoth, Detroit Steel Castings Co.

7:00 p.m. Banquet—Union Building.

Toastmaster—Pat Dwyer, engineering editor, THE FOUNDRY, Cleveland.
Address by John S. Bugas, Federal Bureau of Investigation, Detroit.
Entertainment—By M.S.C.—Music and Dramatic Departments.

Saturday, April 15th

Castability Conference

9:00 a.m. II—Internal Reactions.

Chairman—V. A. Crosby, Climax Molybdenum Co. of Michigan.

(a) Review of Factors Affecting Fluidity of Metals, by W. H. Spencer, Metallurgist, Sealed Power Corp., Muskegon, Mich.

(b) Effect of Raw Material Characteristics on Castability of Metals, by John Lowe, foundry consultant, Lansing.

(c) Short Symposium—Effect of Alloying Elements.

(1) Low, Medium and High Concentration Effects, by E. K. Smith, Electrometallurgical Corp., Detroit.

(2) Castability of Alloy Steel Castings, by R. J. Wilcox, Michigan Steel Casting Co., Detroit.

(3) Ladle Treatments by Graphitizers and Deoxidizers, by R. G. McElwee, Vanadium Corp., Detroit.

1:30-2:30 p.m. Luncheon—Union Building.

Announcements by W. L. Cockrell, Michigan State college.

2:20-4:30 p.m. College Demonstrations.

(1) Demonstration of Crystallization as Influenced by Contour.

(2) Demonstration of Polarized Light to Show Stress Concentration.

Foundry Booklet

Forest City Foundries Co., Cleveland recently issued an attractive booklet illustrating and describing the facilities of the company for producing castings. The publication is introduced by views of the pattern storage room, and continues with pictures showing production of molds, coremaking, melting and pouring, different types of cleaning operations and inspections.

Public Health service, treasury department, Washington, has issued a 32-page bulletin on "Pneumonia Mortality and Measures for Prevention," which may be obtained from the superintendent of documents, Washington, for 10 cents.

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Reader's Comment

EDITOR'S NOTE — *Material Appearing Under this Head Does Not Necessarily Reflect the Opinion of The Foundry or of Its Editors.*

Experience

TO THE EDITORS:

I noticed an article in the January, 1939 issue of THE FOUNDRY headed, "Has Trouble Due to Lead Segregation" in which the mixture described was 50 per cent lead and 50 per cent copper. Some years ago I experienced the same difficulty in handling that alloy.

This was overcome by melting the copper, adding the lead on the first melt and pouring into pig molds. The metal was then remelted four times, and on the fifth melt, it was poured into molds. In that way I avoided the difficulty and secured quite a satisfactory mix of the metals.

R. K. PIPER

717 *Preston Avenue*
Houston, Tex.

Appreciation

TO THE EDITORS:

I have just returned from a trip to California by which I realized an ambition of many years standing to see the petrified forest, the painted desert, Boulder dam and the grand canyon of the Colorado. Mrs. *D* concentrated most of her attention on the glamorous sights and scenes of Hollywood. On some of the long stretches of open road on the way back to Chicago the humming motor induced a certain rhyming reaction which finally resulted in the following:

A green sand molder once did pine for a better job and an office fine and beaucoup gobs of the old mazuma. Conning through THE FOUNDRY pages, reading the work of the sand rat sages, he discovered McLain's System. He sent an inquiry through the mail and from Dave himself received a tale that was mighty interesting. He wrote again to Milwaukee town, enclosed an entry form and money down to get himself quickly started.

He learned to grade the iron and coke; how long the cupola charge should soak to bring down white hot iron. He was taught that to mix by analysis was as easy as to figure his pay and this was a field in which he shone. The deeper he delved in the foundry game the more interesting the work became and the more he loved to study. The former mysteries of cupola practice were made so simple the very fact is they lost their intricacy.

When he reached the section on semisteel he was amazed and quickly learned to feel the term was no misnomer. Likewise a red letter day was no misnomer for the day of days he got his diploma. He framed it right away. His former experience plus McLain's training was a combination that had him straining for a chance to show his stuff. Finally he hooked on to a foreman's job, was made the boss of the whole blamed mob who toiled in an iron foundry.

He knew his vigilance should never tire from the time they lit the cupola fire until they dropped the bottom. Every day when he took off a heat he did his very best to beat the boys in the laboratory. Came a day in the life of this honest gent he was raised to the post of superintendent with a big boost in his pay. What pleased him most was not the money but the realization that he had a honey of an interesting job.

Now that he is older and a little bolder he confesses that he is the green sand molder who once did sigh and pine. He goes to Milwaukee every now and again to shake the good right hand of Dave McLain, his good old foundry mentor.

JOHN DUFFY

10410 *avenue F,*
Chicago.

Radiograph Steel

TO THE EDITOR'S:

Recently we radiographed cast steel 9½ inches thick. We used 500 milligrams of radium at 15-inch focus to film distance for a period of 5 days. The actual area covered satisfactorily was about 10 inches in diameter, or two-thirds the focal film distance. That is due to the increased thickness to be penetrated by the rays toward the ends. Two penetrameters 3/16-inch thick were exposed; one attached to the film holder and the other to the casting surface facing the radium source.

Only the penetrameter nearest the film showed up in the gammagraph. Regular photographic procedure for this type of work was followed: Two duPont x-ray films between 3 foils of 0.06-inch lead; developed with potassium iodide at slightly over 70 degrees Fahr. (a 10 per cent increase over regular developing temperature).

In addition to that experience we learned that a larger amount of radium is much more effective than data gathered from use of small amounts indicate. That was particularly noticeable when checking protective efficiency of the container which while safe for transporting 100 milligrams of radium was absolutely unsafe for use with 500 milligrams. Hence, proper protective devices are a definite requirement. Hidden dangers involved in frequent handling of radium hardly can be stressed strongly enough since radium only should be used with extreme care.

HERBERT R. ISENBERG

St. John X-ray Service Inc.
Long Island City, N. Y.

Anniversary

BILL, UNLIMITED:

Heartiest congratulations!

In addition to having achieved well merited recognition as a very definite institution in the foundry industry, Bill has now reached the 20th milestone of inspiration, encouragement, instruction, and good humor to the readers of THE FOUNDRY.

To your creators is due a large measure of personal congratulation and recognition.

May the institution of Bill continue to succeed and prosper.

ARTHUR J. TUSCANY
Executive Secretary

Foundry Equipment Manufacturers Association, Cleveland

MY DEAR BILL:

In addressing this letter to you I naturally include your two godfathers Pat Dwyer and Harry Richey or in your own lingo 'where in the h—would Charlie McCarty be without Edgar Bergen?'

Twenty years of wise cracks; every day philosophy and crippled cupolas have not only added enjoyment but pertinent foundry facts to me (one of thousands) who look forward to the arrival of THE FOUNDRY and Bill and his gang. So on this anniversary I say "Thank you and many happy returns of the day."

J. H. TRESSLER
Resident Manager

Hickman, Williams & Co.
Cleveland

TO AUTHOR AND ILLUSTRATOR:

I hasten to add my congratulations to those publicly acknowledged in the last issue of THE FOUNDRY noting that Bill is celebrating his 20th anniversary. Time certainly does fly to the reader of a magazine, even though it sometimes carries a clanking chain to hold authors and editors thereof to deadlines. I'll bet that on New Year's of 1919 both of you would have quailed at the thought of 20 long years of Bill!

But anyway you started it and a good job has been well done.

E. E. THUM
Editor

Metal Progress
Cleveland

ADVERTISING PAGES REMOVED

European Foundry Practice

Digest of Recent Literature Covering Various Phases of Castings Manufacture

Steel Fluidity

Fluidity-Temperature Relations of Cast Steels of Various Compositions, by R. J. Sarjant and T. H. Middleham, *Foundry Trade Journal,* London, England, Nov. 3, 1938.

This article comprises one part of the Third Steel Castings report presented at the October meeting of the Iron and Steel institute held in London, and relates to an investigation of fluidity-temperature relations of cast steels. The test employed was the Ruff mold made in oil core sand. The mold is 26 inches long, 5 inches wide and 2½ inches deep, and contains a flow channel 3/16-inch in diameter and 21½ inches long. Conclusions drawn from the results are that:

The method gives a definite relationship between fluidity of cast steel and its temperature. Results are reproduceable, and sufficiently accurate for practical purposes. Fluidity-temperature relations show that divergencies in fluidity of very low carbon steels of similar composition, except for oxygen content, are attributable to the latter. Additions of aluminum up to 0.3 per cent, of silicon up to 1 per cent and of manganese up to 1 per cent confer increased fluidity on low carbon steels.

Copper up to 2 per cent produces only a slightly increased fluidity which in the case of 2 per cent copper is not increased with addition of 0.5 per cent silicon and 0.5 per cent manganese. Practical trials of the Ruff test in the steel foundry show it to possess simplicity and convenience for industrial use and give pertinent information on running qualities of steel for a given casting operation.

Gating and Feeding

Principles of Gating and Feeding, by A. M. Campbell, *Foundry Trade Journal,* London, England, Nov. 17 and 24, 1938.

In this series of two articles the author points out that his subject is one of great controversy, but that certain fundamentals must be adhered to. Those are: (1) To decide the type of gate which is best suited and most convenient to use on the type of casting or kind of metal being poured. (2) The correct size and shape is of next importance as they govern the speed of filling; consideration should be given to the relation between cross sectional area of the main gate and the sprays taken from it.

Personal experience suggests that the main gate cross sectional area should be 50 per cent greater than the sprays. (3) To ensure clean metal entering the mold, use of dirt or slag traps may be necessary. (4) In feeding the first consideration is the kind of metal to be cast on account of the variation in liquid shrinkage. In cast iron the shrinkage is considerably less than in steel, high tensile bronze or monel.

Castings must be considered from the angle of the heavy section which will be formed and adequate risers located at places found by experience as suitable for avoiding shrinkage cavities. Those parts may be too inaccessible for risers and chills and denseners must be used. Casting temperature plays an important part in feeding, but that depends more or less on the kind of metal cast.

With that introduction the author proceeds to illustrate his article with a wide variety of specific castings showing methods of gating and risering applied.

Enameling Cast Iron

Present Status of Enameling of Steel and Cast Iron (Heutiger Stand des Emaillierens von Stahl und Gusseisens), by Louis Vielhaber, *Stahl und Eisen,* Duesseldorf, Germany, Jan. 5, 1939.

Cast iron for enameling should contain 3.4 to 3.7 per cent carbon, 2.5 to 2.8 per cent graphite, 2.3 to 2.6 per cent silicon, 0.4 to 0.8 per cent manganese, 0.6 to 1.1 per cent phosphorus, and 0.07 to 0.1 per cent sulphur, while steel should contain 0.05 to 0.07 per cent carbon, 0.35 to 0.40 per cent manganese, under 0.04 per cent phosphorus, under 0.04 per cent sulphur, and traces of silicon. Preparation of the surface is important to insure a firm enamel coating, and the author describes the methods. He then follows with data on compositions of ground coats and finish enamels, firing conditions and equipment, appearance of defects, and properties and applications of enameled steel and cast iron.

Surface Hardening

Autogenous Hardening of Cast Iron and Malleable Cast Iron (Autogenes Haerten von Gusseisen und Temperguss), by Gottfried Kritzler and Franz Roll, *Die Giesserei,* Duesseldorf, Germany, Dec. 2, 1938.

Authors discuss the theoretical considerations, investigations of duration of heating, heating temperature, quenching speed, quenching mediums, and hardness involved in surface hardening of cast iron and malleable cast iron. They conclude that with blackheart malleable, it is possible to obtain through surface hardening a pearlitic, sorbitic, martensitic, and cementitic to martensitic structure. Hardness may range from 200 to 600 brinell according to the procedure employed. The higher the retention of hardness the material must possess, the higher the hardness must be through production of cementite. Quenching in air, oil or water may be used to attain the desired hardness.

Resisting Wear

Wear Resistance of Cast Iron and Malleable Iron, by W. West and C. C. Hodgson, *Foundry Trade Journal,* London, England, Jan. 5, 1939.

Information presented in this article was gathered with a view to its application for internal combustion engines. The authors discuss various types of iron available, and mention one alloy iron containing 1.74 per cent carbon, 0.62 per cent silicon, 0.63 per cent manganese, 0.05 per cent sulphur, 0.64 per cent molybdenum, and 1.94 per cent nickel which when subjected to a heat treatment as follows: 9 hours at 1000 degrees Cent.; cooled 950 degrees Cent.; 8 hours at 950 degrees cooled to 900 degrees; 7 hours at 900 degrees, cooled in air; reheated to 900 degrees, transferred to a furnace at 650 degrees, held for 1 hour, then cooled in air; reheated to 850 degrees for 1 hour and cooled in air, tempered at 550 degrees Cent., gave a tensile strength of 63.2 tons (141,500 pounds) per square inch.

However, in wear tests conducted on a 6-cylinder engine run at full load, the authors found that a centrifugally cast liner containing 3.4 per cent carbon, 2.3 per cent silicon, 0.9 per cent manganese, 0.8 per cent phosphorus, 0.7 per cent chromium, and brinell hardness 340, showed the least wear.

Wear Resistance

Wear Resistance of Gray Iron with Particular Consideration of Cylinder Blocks and Liners (Abnuetzungswiderstand von Grauguss mit besonderer Beruecksichtigung der Zylinderbloecke und -buechsen), by M. v. Schwarz, *Die Giesserei,* Duesseldorf, Germany, Dec. 16, 1939.

This article gives data on wear tests conducted on one electric furnace steel containing 0.95 per cent carbon, 0.30 per cent manganese, 0.15 per cent silicon, 0.02 per cent phosphorus, and 0.021 per cent sulphur, and three cast irons. One plain cylinder block iron contains 2.95 per cent carbon, 2.6 per cent silicon, 0.65 per cent manganese, 0.55 per cent phosphorus, 0.04 per cent sulphur, and traces of nickel and chromium. An alloy cylinder iron contains 3.15 per cent carbon, 2.0 per cent silicon, 0.7 per cent manganese, 0.45 per cent phosphorus, 0.03 per cent sulphur, 1.1 per cent nickel, and 0.38 per cent chromium. The third a cast iron with a smooth, lapped surface contains 3.4 per cent carbon, 2.4 per cent silicon, 0.5 per cent manganese, 0.4 per cent phosphorus, and 0.08 per cent sulphur.

Magnesium Alloys

Improvement of Cast Aluminum-Magnesium Alloys by Additions of Beryllium and Titanium, by Gaston Gauthier, *Foundry Trade Journal,* London, England, Nov. 17, 1938.

Surface of molten aluminum-magnesium alloys, containing up to 12 per cent magnesium, oxidizes rapidly. That is particularly troublesome when the alloys are poured in green sand. To eliminate that difficulty the author investigated the effect of additions of various elements including zirconium, boron, titanium, and beryllium. He found that best results were obtained with addition of 0.02 per cent beryllium. Such addition seems to depress the rate of oxidation of magnesium to that of aluminum, and the casting after cooling is covered with a thin brown skin which is removed easily by gentle sandblasting or pickling. Beryllium addition also prevents formation of the usual displeasing gray or black skin; the color being an almost golden tint.

Unfortunately, addition of beryllium increased grain size of the aluminum-magnesium alloys, and reduced tensile strength and elongation. Study of the problem revealed that addition of 0.05 per cent titanium suppressed grain coarsening and increased the physical properties considerably. In remelting, the addition of titanium is reduced to 0.02 per cent.

OBITUARY

ALBERT SAUVEUR, 75, Gordon McKay professor of metallurgy emeritus, Harvard university, died at his home in Boston Jan. 26. As a pioneer in and authority on metallurgical subjects he had a world wide reputation. Of French parentage he was born in Louvain, Belgium in 1863 and was educated at the school of mines, Liege. He was granted a B. S. degree in mining and metallurgy by Massachusetts Institute of Technology in 1889. From 1889 to 1897 he was chemist and metallurgist for various steel companies including the Pennsylvania Steel Co., and the Illinois Steel Co. At the South Chicago plant of the latter company he began his pioneer work in metallographic research in connection with heat treating experiments destined to exert such a wide influence on the manufacture and heat treatment of steel. In 1899 he was appointed instructor at Harvard university and was assistant professor in metallurgy and metallography from 1900 to 1905. Since 1905 he has held the Gordon McKay professorship in metallurgy and has been active in committee work for various technical societies. He was a member of a wide range of educational and technical associations in this and various foreign countries, recipient of medals from foreign governments and degrees from foreign universities. He presented papers before many technical associations and probably is best known through his book *The Metallography and Heat Treatment of Iron and Steel.*

* * *

William F. Chase, purchasing agent and office manager, Hartford Electric Steel Corp., Hartford, Conn., died Jan. 4.

* * *

Henry Roos, 84, founder and president, Henry Roos Foundry Co., Chicago, died Feb. 15 in Norwegian-American hospital, Chicago.

* * *

Jacob Klaser, 77, an employe of National Malleable & Steel Casting Co., Sharon, Pa., for 32 years died recently.

* * *

James Flockhart, 85, long regarded as the dean of Newark foundrymen, died Jan. 30 at Ormonde Beach, Fla. Mr. Flockhart retired about 4 years ago as president of the Flockhart Foundry Co., Newark, N. J. He was one of the founders of the organization in 1882, the company at that time being known as Maher & Flockhart. In 1918, the company became the Flockhart Foundry Co. Mr. Flockhart was born in Paisley, Scotland, and as a young man of about 25 years came to this country in 1879. He previously had a full eight years apprenticeship training in Scotland. He was one of the founders in 1901 of the Newark Foundrymen's association, now known as the New Jersey Foundrymen's association.

* * *

Charles Mason Griffith, 70, retired vice president, Taylor-Wharton Iron & Steel Co., Wharton, N. J., died in Easton Pa. recently.

* * *

Harold W. Anderson Sr., 59, died at his home in Chicago, Jan. 11. He was vice president, Anderson Bros. Brass Foundry.

* * *

Roy A. North, 66, president, Green Bay Foundry & Machine Co., Green Bay, Wis., died recently. Mr. North was an executive of R. J. Dowd Co., Beloit, Wis., before becoming head of the Green Bay company in 1914. His son, James P. North is vice president of the company.

* * *

William Sherwood, 87, former president, Sherwood Brass Works, Detroit, died at his home in that city Jan. 20. Mr. Sherwood was born in Lincolnshire England in 1851. He started in business in 1893 with the Buick-Sherwood Mfg. Co., his partner being the late David Buick who later formed the Buick Motor Car Co.

* * *

Wilfred Strong, 65, treasurer, Kalamazoo Foundry & Machine Co., Kalamazoo, Mich., was killed recently when a passenger train struck his auto. Mr. Strong had been with the company 35 years.

* * *

Colin B. Gilchrist, 65, secretary-treasurer, American Foundry Co., Indianapolis, Ind., died recently in that city. Mr. Gilchrist was a native of Evansville, Ind. and went to Indianapolis in 1900 as a representative of coal mines before becoming associated with the foundry company.

Detroit Foundries

(*Concluded from page* 31)

tions of the plant to handle increased production more efficiently.

Outside the automotive industry also are signs of improving activity in foundry lines. Marshall Furnace Co., Marshall, Mich., now operating one 15-ton cupola, is proposing to increase melting capacity to about 80 tons per day to meet demands of a new stove and furnace line now being handled. Sandslinging equipment, power conveyors, dust collectors, automatic airless cleaning equipment to handle 6 tons per hour, and other devices are involved in this expansion.

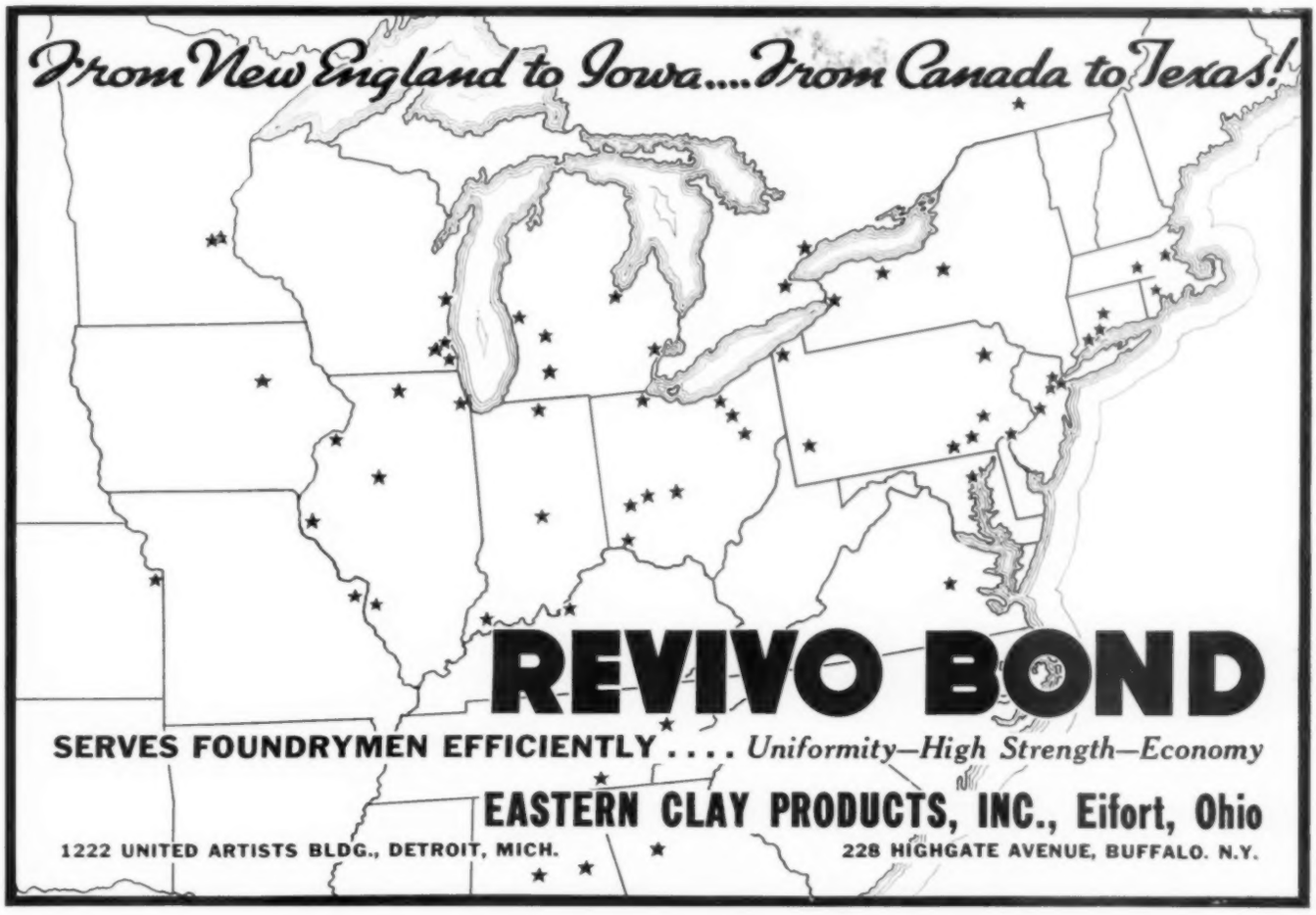
Kalamazoo Stove Co., Kalamazoo, Mich., is revamping its stove manufacturing department at a reported cost of $200,000, and has acquired the Walker & Pratt Mfg. Co., Watertown, Mass., as an eastern manufacturing plant. The latter company is one of the oldest and best known foundries in the East and operates two 15-ton cupolas, also supplying brass and aluminum castings. Lewis Moore Jr., formerly general superintendent at Kalamazoo has been transferred to Watertown to take charge of operations.

Considerable encouragement is felt in the furnace field because of the steady improvement in sales of warm air furnaces in recent years. This is attributed to the fact this type of heating is about the only system which can be used in connection with a central heating and air conditioning system. With a large share of new residential construction involving air conditioning equipment, the revival of business in warm air heating furnaces is understandable.

A type of dry dust collecting, applicable to foundries, recently has been installed in a machine shop where the collection of dry dust from cast iron machining operations is involved. Central unit of the system is a large sheet steel duct of balloon-shaped cross section. This main duct is erected either on the roof of the plant or inside in the monitor and may be of length suitable for handling all the branch mains from machines and departments in the plant. The central duct is of constant cross sections and at the base has a track in which a scraper conveyor rides. The conveyor is of the endless belt type and scrapes all dust settling in the main to one end where it falls into a hopper for disposal.

At intervals along the duct, exhaust fans are cut in, usually with a cloth type dust filter between the fan and the duct. Thus, air is drawn in from plant operations and travels through the main duct, where heavier particles settle out, then through the dust filter and the exhaust fan to the outside. In summer the exhaust air is directed to the outside atmosphere, but in winter a gate valve is shifted and the air returned to the plant. The latter arrangement permits appreciable savings in fuel bills, since the cleaned air still retains much of the heat received in the plant.

One system of this type, installed to handle dry dust from machining operations at a Buick plant, is 450 feet in length, with two exhaust fans connected into the line, and the duct located on the plant roof.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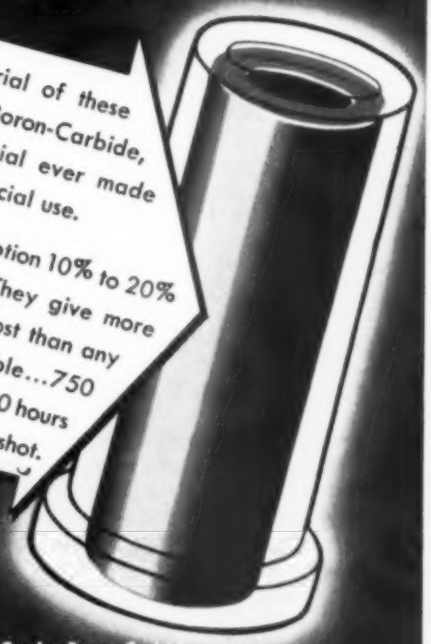
The lining material of these nozzles is Norton Boron-Carbide, the hardest material ever made by man for commercial use.

Decrease air consumption 10% to 20% over iron nozzles. They give more service per dollar cost than any nozzle now available...750 hours with sand, 1500 hours with steel grit and shot.



Guarantee—
1500 Hours with Steel Abrasive—
750 Hours with Sand

*Trade-mark of Norton Co. for Boron Carbide

PANGBORN

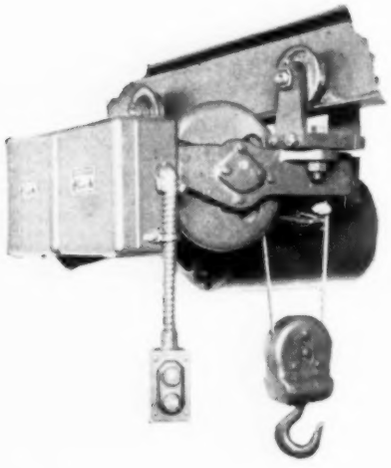
The World's Largest Manufacturer of Blast Cleaning and Dust Collecting Equipment

HAGERSTOWN - - - - - MARYLAND

NEW EQUIPMENT and SUPPLIES

Two-speed Hoist

A new 2-speed, alternating current hoist has been designed by Electro Lift Inc., 30 Church street,



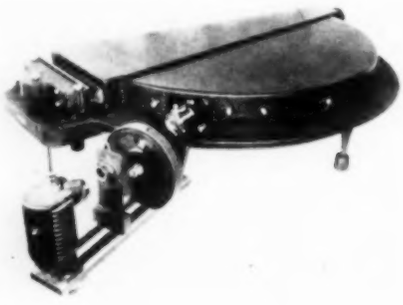
New York, to give slow speed for starting, inching, running, and stopping, and fast speeds for rapid handling. It is said to be particularly suitable for serving foundries, furnaces, machine tools, etc. where gradual starting is required. The hoist has a squirrel cage motor, and is built in sizes from ¼ to 6-ton capacities. It also may be equipped with traveling rope guide on the drum to eliminate crossed or piled up cables where loads are pulled at an angle.

Hoist has worm drive with worm and wheel running on tapered roller bearings, and is fully enclosed within the gear case. Motor has ball bearings, and is attached directly to the hoist frame. Entire load is carried on a rigid cast steel frame. The hoist has close headroom permitting the hook to reach within minimum distance of overhead track. It has a safety type hook block with guard completely enclosing bottom sheave. Hoist is built in both single and twin hook types. Control may be either rope or push button type.

Spectrograph

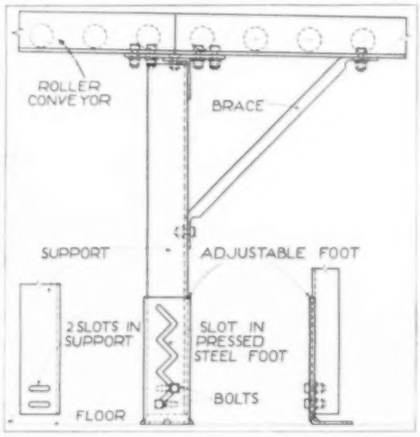
Harry W. Dietert Co., 9330 Roselawn avenue, Detroit, has introduced a development in the Applied Research Laboratories spectrograph. The spectrograph is supplied with an attractive and durable cover and also with an optical bench. The cover allows the spectrograph to be operated in a lighted room. A film transfer case is used to remove the exposed film from the camera. This film then is taken to a dark room and developed.

The optical bench is of rigid construction fitted with a V-groove to insure exact alignment of the rotating sector, lens holder, arc or spark stand and sector photometer. With these developments, spectrographic analysis of materials, either by the emission or absorption method, is facilitated greatly. It is claimed that the changes also allow quick and easy film calibration with step sector.



Floor Support

Logan Co., 580 Buchanan street, Louisville, Ky., has introduced a new type of adjustable floor sup-



port for conveyors as shown in the accompanying illustration. The zig-zag slot in the adjustable foot portion of this conveyor floor support prevents slipping under heavy loads. The new zig-zag slot will hold the leg in position without the necessity of drawing up the nut extremely tight. This maintains correct alignment for the carrying surface of the conveyor, thus giving proper operation of the equipment and simplifying the adjustment when changes in height are necessary.

Fireproof Panels

Johns-Manville Co. has opened a new unit at North Billerica, Mass., for the production of fireproof panels made from asbestos fiber and an inorganic binder. The material called marinite can be used

(*Continued on Page* 104)

BROSIUS automatic dump buckets

are highly rated by safety engineers in steel mills, industrial plants, and foundries where many accidents have been traced to manually tripped dump buckets. BROSIUS automatic dump buckets eliminate the necessity of having a man stationed at the dumping point, because the buckets are handled entirely by the craneman. They cannot be unlatched in mid-air, and can be dumped from most any uneven surface or slope.

★

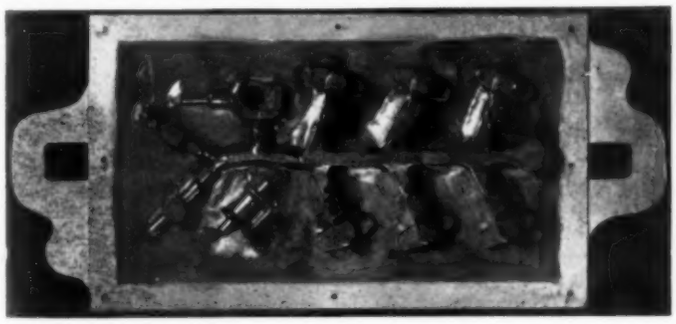
BROSIUS minimum headroom single hook grab buckets trip by hand line, either from the operator's cage or from the ground. Simple and sturdy in construction, they open without shock to the crane or to the bucket. By throwing the hook block of the bucket over the hook of the crane, you have a bucket crane, just like that.

BROSIUS self-contained auto floor charging machines, built in capacities from 2000 to 10,000 lbs. for serving melting furnaces, heating furnaces, mills, etc. Ideal for restricted areas.

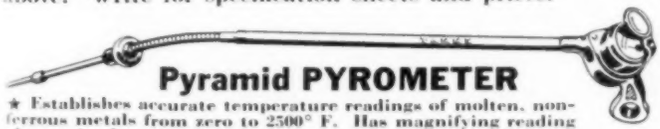
**Brosius Equipment patented in the United States and Foreign Countries.*

EDGAR E. BROSIUS, INC.
DESIGNERS AND MANUFACTURERS, PITTSBURGH (SHARPSBURG BRANCH) PA.
EUROPEAN DISTRIBUTOR: DANGO & DIENENTHAL, SIEGEN, WESTPHALIA, GERMANY

TAMASTONE
The Perfect Pattern Compound

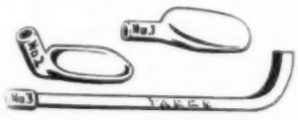


★ Cuts loose pattern work costs 50 to 75% and doubles production! Also can be used to make core sand dryers. Drys smooth as glass. No shrinkage possible. Loose patterns are converted into match plate production work as shown above. Write for specification sheets and prices.



Pyramid PYROMETER

★ Establishes accurate temperature readings of molten, non-ferrous metals from zero to 2500° F. Has magnifying reading glass, pistol grip handle, thumb screw adjuster. Thermo couple unit mounted on flexible shaft. Get bulletin now!



Pyramid SKIMMERS

★ Scientific assurance against contamination of finished castings. Made of heat resisting alloys that withstand temperatures up to 2700° F. Write for literature and prices!

Foundry Division—TAMMS SILICA CO.
28 N. LaSalle St., Dept. F3, Chicago, Ill.

It Lasts for Years and Years

Model 10
HEAVY DUTY FLOOR GRINDER

Write for Catalog No. 52

HEAVY DUTY, over-powered, high quality, efficient and long-lasting. Once installed this brutally strong floor grinder stays on the job year after year requiring practically no repairs. Model 10 is never an expense — it's an investment which pays handsome dividends.

Heavy duty motors, ball bearings, one-piece chrome manganese alloy steel spindle, push-button control, semi-steel wheel guards, tool rests, eye shields, water pot, shaft-locking device on spindle and many other features.

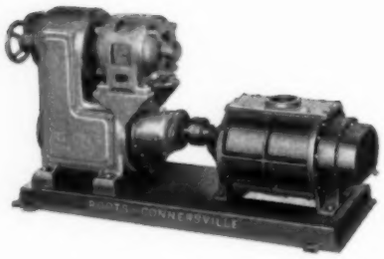
THE UNITED STATES ELECTRICAL TOOL CO.
CINCINNATI, OHIO, U.S.A.

(*Continued from page* 102)

as an insulating material in construction of ovens etc., where temperatures do not exceed 900 degrees Fahr. The material has a transverse strength of 900 pounds per square inch.

Varies Air Volume

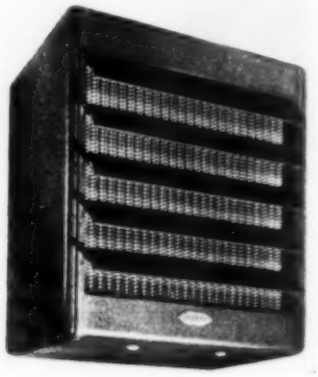
Roots-Connersville Blower Corp., Connersville, Ind., now is supplying units including variable speed drives which permit positive control of desired changes in air delivery. In a majority of installations, manual control is employed,



but it is possible to supply automatically operated control to change speeds and air volumes. The accompanying illustration shows one of the firm's blowers with a variable speed drive which will deliver volumes ranging from 70 to 420 cubic feet of air per minute against a constant pressure. Other sizes are available for smaller or larger capacities, and for other ratios of change.

Unit Heater

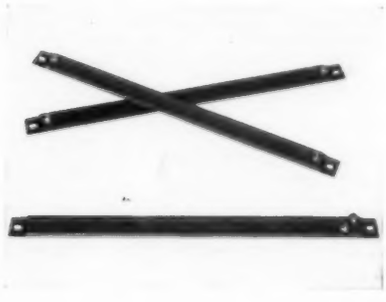
Fedders Mfg. Co. Buffalo, has developed a line of series 4 unit heaters available in 25 models. New features of these units are cabinets embellished with integral beading, heating elements with double headers, redesigned manifolds, and floating mountings for eliminating expansion stresses and maintaining alignment between element and cabinet. Other features are streamline tubes, individual convoluted fins, and rubber mounted motors.



Motors are mounted in rubber to isolate vibration. Rubber cushions are concentric with motor shaft to prevent magnified deflection and vibration of fan blades. Fans are statically and dynamically balanced. Motors for all current characteristics are available.

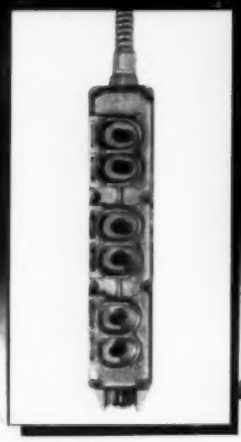
Strip Heater

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., announces two new types of strip heaters designed to produce fast economical heat. Made in two temperature ratings of 750 and 1200 degrees Fahr. on the sheath, it is stated these heaters are



Push button control

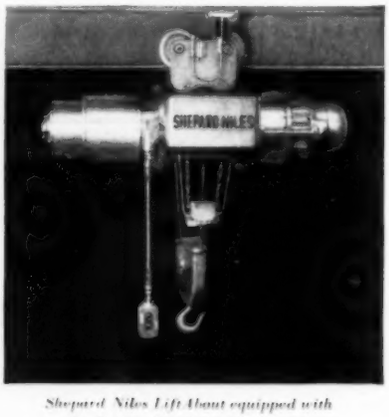
MULTIPLE OR SINGLE SPEED *for* ELECTRIC CRANES AND HOISTS



Shepard Niles multiple speed push button control for all 6 travel motions applied to 3-motor electric traveling crane.

SHEPARD NILES multiple speed push button control provides 5 selective speeds by one push button for each travel motion. Each button as it is pressed inward makes five electrical contacts, corresponding to five independent speeds in each direction of travel

Push button master switch cases are of aluminum alloy and made slender enough to be grasped easily with the hand. An assembly of two or three master switches in tandem can be furnished for the control of 2-motor and 3-motor cranes and hoists. An emergency stop switch is provided at the lower end of the assembly.



Shepard Niles Lift Abaut equipped with single speed push button control.

A COMPLETE LINE OF CRANES & HOISTS

SHEPARD NILES CRANE & HOIST CORP.

360 SCHUYLER AVENUE . . . MONTOUR FALLS, N. Y.

particularly applicable on crane cabs, valve house, elevators, ovens, metal water tanks, pipe lines, hydrants, hot tables, metal molds, foundry platens, wherever ease of application and convenience are requirements. Heaters may be obtained either with both terminals at one end or at opposite ends. Heating elements with refractory insulation and sealed against moisture are enclosed. Bolt holes are provided at each end for quick and permanent installation. Available for operation on 115 volts, 230 volts and two styles for 250 volts, the heaters include sizes 8, 12, 18, 24, 30½, 36 and 43 inches in length with ratings from 150 to 1250 watts.

Floor Repairs

Flexrock Co., 800 North Delaware avenue, Philadelphia, has introduced a primer which is processed with

cellulose. It is claimed that this process provides strength, excellent cementing properties and holds tenaciously to nearly any surface. It is also pointed out that the primer will stand considerable vibration and maintain its grip. As shown in the accompanying illustration, the new primer is applied with a brush after it has been thinned with about 10 to 30 per cent of water.

That company also has introduced a nonslip wax made from carnauba treated by a special process. The wax is designed for office floors, public buildings, etc.

Galvanizing Flux

Hanson-Van Winkle-Munning Co., Matawan, N. J., has placed on the market a newly developed flux for hot galvanizing operations. The flux is a zinc ammonium chloride type. Dissolved in water the flux is said to replace muriatic acid in dipping previous to hot galvanizing. The crystalline flux is employed as a cover on the galvanizing pots instead of sal ammoniac. Use of the product as a flux wash is said to reduce dross production, and introduction of iron into the pots.

Gate Valves

Monat Valve & Forge Co., Bessemer building, Pittsburgh, recently has developed a packless, cylindrical gate valve, suitable for high as well as low pressures and temperatures. This new valve contains many of the salient features of both gate and plug valves. The body of the valve carries a cylindrical bore, at right angles to the line of flow. A cylindrical gate is moved up and down by a screw in the valve bonnet, and is prevented from turning by a key in the cylindrical bore. The run of the valve conforms in shape and size to that of the pipe. Valve is available in sizes ranging from ½ to 8 inches in both the standard metals and corrosion-resistant alloys.

Handguard

A reversible, chrome leather, handguard which fits either hand, recently has been placed on the market by the Industrial Gloves Co., Danville, Ill. The new handguard is said to provide efficient protection in handling pig iron, foundry scrap, metal shapes, etc., and gives double

Personalized

SHIRT SLEEVE SERVICE

PIG IRON

Makes Better Castings

When is pig iron more than a chunk of pig iron? Answer—when it is Sloss "Personalized" Pig Iron.

When you buy Sloss iron, we remain interested in that iron as it goes through your foundry and even after it reaches your customer. Instead of loading your iron on a freight car and forgetting it, our Shirt-Sleeve Service men stand ready to follow it into your foundry, and there cooperate with your own staff to lower your costs and improve your castings, as they have done for other foundry operators.

Sloss Shirt Sleeve Service men are practical foundrymen. They know cupola practice. They know sand. They know how to obtain heat resistant castings. They know enameling. Their service personalizes Sloss Iron—insures that you obtain full benefit of its high quality and many advantages. Address inquiries to Sloss-Sheffield Steel & Iron Company, Birmingham, Ala.

SLOSS

SPECIALISTS IN FOUNDRY IRON

LADLE-MIXED FOR UNIFORMITY

service because it may be worn on either hand. To assure maximum protection steel ribbons have been placed diagonally on wearing surfaces to give service against sharp, cutting edges of objects handled. The guard is 7 inches long, and may be worn with cotton gloves or over bare hands. It can be supplied in 6 and 7½-inch lengths, and is available in plain leather, and without ribbons; also in wool felt, cotton webbing, and rubber.

Hand Press

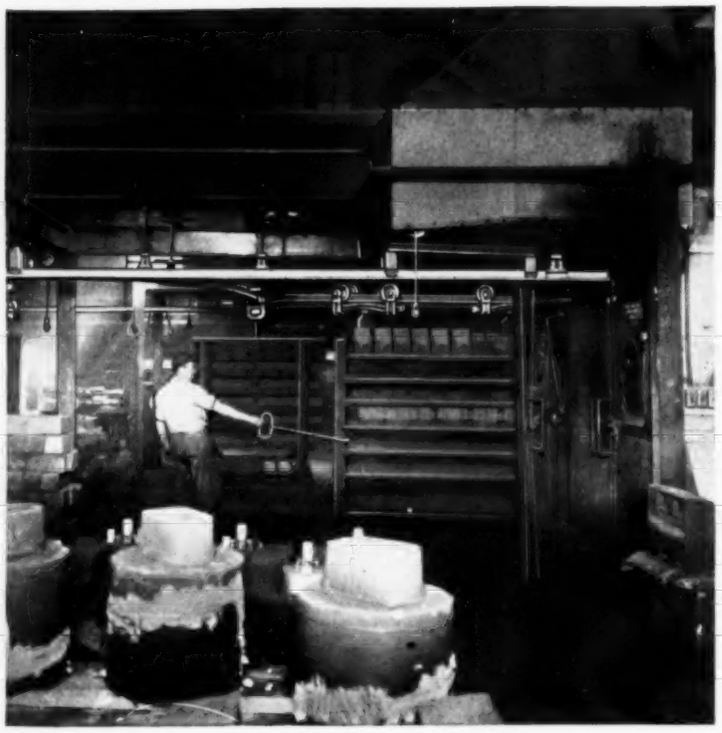
James A. Murphy & Co., Hamilton, O., has developed and placed on the market a new machine especially designed for pressing dough rolls or other material for sealing

mold parts in foundry assembly operations. The device, shown in the accompanying illustration, may be bolted to the bench or any other convenient support. The barrel 2 inches diameter and 9 inches in length has a capacity of 30 cubic inches. Machine is loaded by removing plug and filling the barrel with roll material. Two extension plugs with ⅜ and ½-inch openings—or any other desired size—are supplied with the hand press. It is claimed the machine will turn out more dough rolls in 15 minutes than a man can make in 3 hours by hand and also save more than 50 per cent of the material. Also the machine made roll is uniform in cross section and will bear evenly on the mold joint and thus prevent runouts or crushes.

Unit Heater

Airtherm Mfg. Co., 1474 South Vandeventer avenue, St. Louis, has introduced a complete line of direct fired unit heaters for gas, oil or coal, hand or stoker fired. The new unit, shown in the accompanying illustration, is available in a wide range of sizes suitable for many purposes. Among the claims advanced for the heater are that it has a minimum number of parts, high efficiency in the combustion chamber, comparatively low outlet temperatures and a horizontal high velocity air stream with adjustable wide angle of delivery.

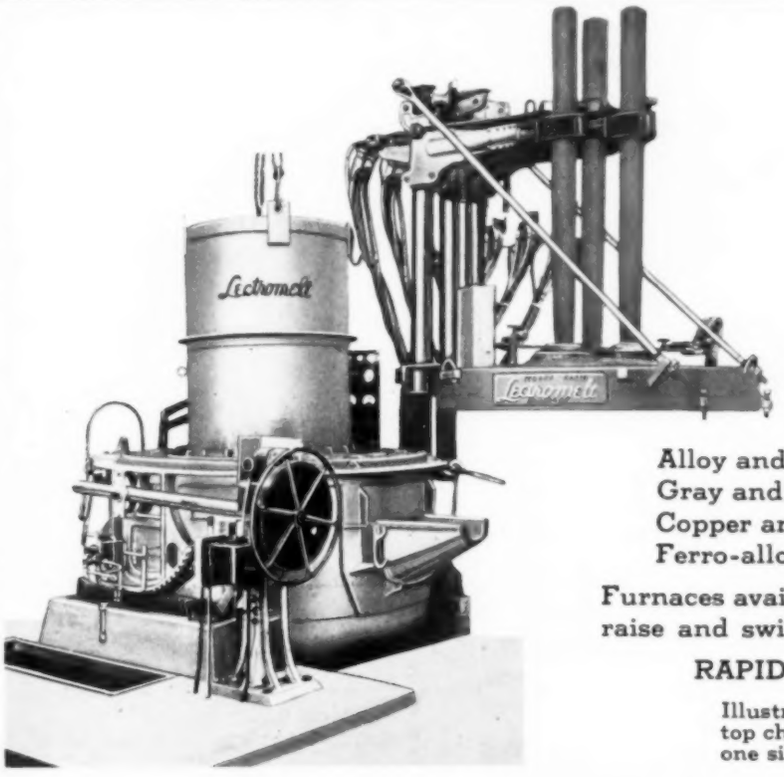
CLEVELAND TRAMRAIL
OVER HEAD HANDLING EQUIPMENT



● Core Handling put on "Tramrail Overhead," insures a smooth unobstructed path over which rack loads of these, easily damaged items, can be handled to, through and from the core ovens, with a minimum of cost and no losses.

ALSO BUILDERS OF CLEVELAND CRANES ALL WELDED

CLEVELAND TRAMRAIL
DIVISION OF
THE CLEVELAND CRANE & ENGINEERING CO.
1155 Depot St.
WICKLIFFE, OHIO.
Or Consult Your Phone Directory under Cleveland Tramrail



MOORE RAPID

Lectromelt

FURNACES

for

MELTING
REFINING
SMELTING

Alloy and Carbon steels
Gray and Malleable irons
Copper and Nickel and Alloys
Ferro-alloys, Carbide, and Special products

Furnaces available in top-charge type with quick raise and swing roof—also in door-charge types.

RAPID - ECONOMICAL - RUGGED

Illustration shows new LECTROMELT top charge furnace with roof rotated to one side and charging bucket in place.

PITTSBURGH LECTROMELT FURNACE CORP.

P. O. BOX 1257 PITTSBURGH, PA.

COMB'S GYRATORY RIDDLES

Greatly Reduce Riddling Costs Through Speed and Labor Saving

Available in four types and sizes, Comb's Gyratory Riddles are noted for their low maintenance cost (½c to 1c per hour) and their enormous capacity.

• • •

30 DAYS FREE TRIAL

Write for descriptive catalogue; choose the type best suited to your needs and use it for 30 days. We pay the freight both ways if you decide to return it!

GREAT WESTERN MFG. CO.
Leavenworth, Kansas

Many Foundries Report

Substantial Savings

When Using

SMILLIE VENTS

FOR BLOWING CORES

Sizes from ⅛" to 1" in ¼" steps Samples Upon Request

C. M. SMILLIE & CO.

520 E. Larned St. Detroit, Mich.

ECONOMY — When Costs Are Up — and Competition Keen!

STOW

Inventors of Flexible Shafts for 64 years standard the world over.

Stow Flexible Shafts and Flexible Shaft equipment are making new economy records in foundries where production costs are up and where competition demands cleaner, more finished castings. 10 Different mountings. High or low speed—⅛ to 10 H.P.

FREE! Catalogue 38. Write for it.

STOW MANUFACTURING CO., Inc.

23 SHEAR ST., BINGHAMTON, N. Y.

FOUNDRY ACTIVITIES

MARENGO Foundry Co., Marengo, Ill., started Feb. 1, employing about 12 men. The company will make light gray iron castings. W. T. Milles is president.

* * *

Norman Chivvis, vice president and William H. Bies, treasurer, National Bearing Metals Corp., St. Louis, have resigned and have purchased the Progressive Brass Mfg. Co., Kansas City, Mo. and will operate it as the Prairie Brass & Metal Co.

* * *

The newly formed Troy Foundry Co. Inc., has taken over the foundry department of Burden Iron Co., Troy, N. Y., and is continuing operations with a force of 15 to 20.

The company has been incorporated for $5000 and Louis W. Johnson is president and treasurer.

* * *

Empire Foundry Co., 98 Olean street, Rochester, N. Y., recently was damaged $1200 by fire.

* * *

Norwood Engineering Co., Florence, Mass., has leased its foundry to Thomas Ruddeforth, who will operate as the Norwood Foundry Co.

* * *

International Meehanite Metal Co. Ltd., London, subsidiary of Meehanite Metal Corp., Pittsburgh, has licensed C. A. Parsons & Co. Ltd., Newcastle-on-Tyne, England, to manufacture meehanite metal.

* * *

Ramsey Pump Corp., Seneca Falls, N. Y., recently has leased its gray iron foundry to the WPW Specialties Co. The Ramsey Pump Corp. will continue to operate its brass foundry.

* * *

Southern Malleable Iron Co., Twenty-first and Bond streets, East St. Louis, Ill., announced recently that the company will go out of business as soon as current orders

(*Concluded on page* 110)

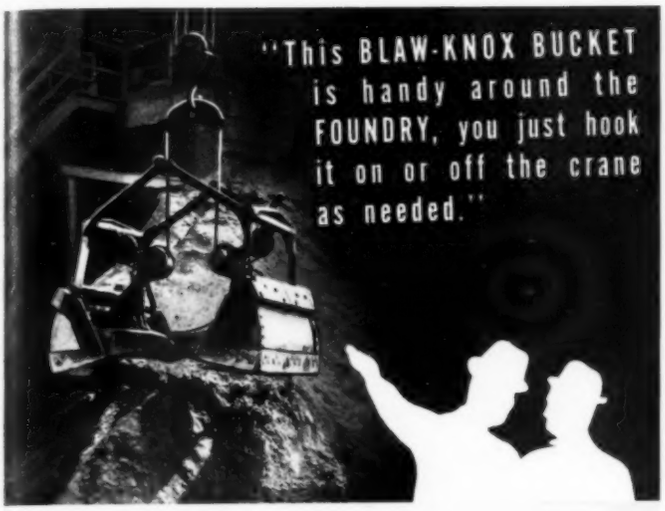
Truscon Copper-bearing Steel Foundry Flasks are easy on the muscles. No needless weight *"muscles in"* to steal time and energy of molders. • Light weight and great strength of Truscon Flasks are obtained by deep ribs and flanges extending full depth all around. Made of copper-bearing steel, Truscon Flasks are durable and rust-resisting. • Send for your copy of the Truscon Flask Catalog which illustrates and explains all types of flasks designed for handling by one man, two men or by power equipment.

TRUSCON STEEL COMPANY • FOUNDRY FLASK DIVISION
6100 TRUSCON AVENUE • CLEVELAND, OHIO
SUBSIDIARY: REPUBLIC STEEL CORPORATION

TRUSCON
COPPER-BEARING STEEL FOUNDRY FLASKS

RAW MATERIAL PRICES
Feb. 21, 1939

Iron	
No. 2 foundry, Valley	$21.00
No. 2 Southern Birmingham	17.00
No. 2 foundry, Chicago	21.00
No. 2 foundry, Buffalo	21.00
Basic, Buffalo	20.00
Basic, Valley	20.50
Malleable, Chicago	21.00
Malleable, Buffalo	21.50
Charcoal iron, furnace	25.00
Coke	
Connellsville beehive premium	$5.50 to $6.30
Wise county beehive coke	5.50 to 6.50
Detroit by-product delivered	10.25
Scrap	
Heavy melting steel, Valley, No. 2	$13.50 to $14.00
Heavy melting steel, Pittsburgh, No. 2	14.75 to 15.25
Heavy melting steel, Chicago, Auto No. 2	11.50 to 12.00
Stove plate, Buffalo	13.00 to 13.50
Stove plate, Chicago	8.50 to 9.00
No. 1 cast, mchy. New York	12.00 to 12.50
No. 1 cast, mchy., Chicago	12.00 to 12.50
No. 1 cast, Pittsburgh	15.25 to 15.75
No. 1 cast, Philadelphia	16.50 to 17.00
No. 1 cast, Birmingham	14.00 to 14.50
Car wheels, iron, Pittsburgh	15.00 to 15.50
Car wheels, iron, Chicago	13.50 to 14.00
Railroad malleable, Chicago	15.00 to 15.50
Malleable, Buffalo	13.50 to 14.00
Nonferrous Metals	**Cents per pound**
Castings copper, refinery	10.12½
Straits tin	45.45
Aluminum, 99 per cent	20.00
Aluminum, No. 12 (Secondary, standard)	12.75 to 13.25
Lead, New York	4.75
Antimony, New York	11.25
Nickel, electro	35.00
Zinc, East St. Louis, Ill.	4.50

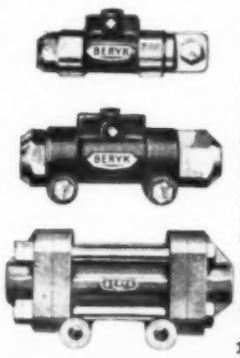


Blaw-Knox Hook-On Buckets are made in two types for foundry service, the regular and the "Foundry Type" which is built especially to meet the requirement of limited head room clearance, both multiply the value of your crane investment. Ask for Catalog 1224.

BLAW-KNOX *Digging and Rehandling* **BUCKETS**

BLAW-KNOX DIVISION
• OF BLAW-KNOX CO. •
Farmers Bank Bldg. Pittsburgh, Pa.

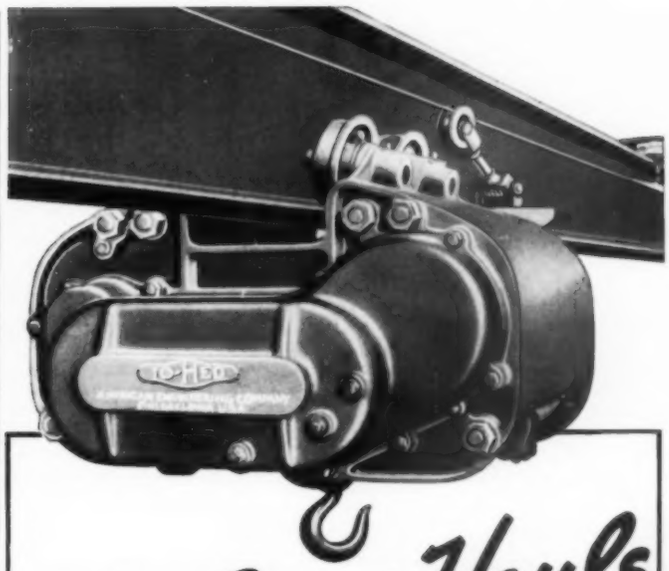
Use these **VIBRATORS** *for 10 days at* **OUR EXPENSE!**



★ Give these **BERYK** vibrators a trial on your hardest jobs, at our expense if necessary. Then it is up to you to either return them or keep them on the job. You can easily decide which. We honestly believe that it will pay you to investigate the advantages of using **BERYK** vibrators as standard equipment in your foundry. They are dependable, sure and quick starters and economical in the use of air. Send us a trial order and make us prove it! Available in sizes from ½" to 3" for all types of molding machines and pattern plates.

THE BERYK COMPANY
1266 West 2nd St., Cleveland, O.

THE
JACKSON IRON & STEEL
COMPANY
Manufacturers of
"JISCO"
SILVERY
PIG IRON SPECIALTIES
■
JACKSON OHIO



For Short Hauls *use the*
PLAIN TROLLEY TYPE
A-E-CO LO-HED HOIST

The *plain trolley type* A-E-CO Lo-Hed hoist—the one you can pull along the rail—is the sensible choice under these conditions:

1. When the haul is short and the load not too heavy.
2. When the path under the hoist is walkable.
3. When the haul is long but seldom repeated.
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- Compact, strong, simply constructed.
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- Heavy duty, ball-bearing HOIST motor.
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- Ball or roller bearings at vital points.
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ADVERTISING PAGES REMOVED

(*Concluded from page* 108)

are filled and physical assets of the company can be liquidated. The company was organized with a capitalization of $750,000 and employed approximately 250 men engaged in general jobbing of malleable castings.

* * *

Index of foundry equipment orders for January, according to a report of the Foundry Equipment Manufacturerss' association, Cleveland was 122.3 as compared with 141.8 in December and 76.8 in January, 1938. Index of shipments was 96.3 as compared with 102.8 in December and 147.7 in January, 1938.

NEW TRADE PUBLICATIONS

CONVEYORS — Link-Belt Co., Chicago, has issued general catalog 700, an advance edition, which covers the complete line of Link-Belt equipment. The catalog has 1247 pages and carries complete specifications on chains and sprocket wheels, power transmission equipment, positive drives, bucket elevators, screw conveyors and accessories, belt, flight, and apron conveyors, screening, washing and drying equipment, engineering data and a chain and general index.

BURNERS — Hauck Mfg. Co., 124 Tenth street, Brooklyn, N. Y., has published a catalog covering its low pressure air-gas induction mixers, high pressure gas inspirators, high pressure air boosters and burner nozzles. Included are layouts showing the construction of the various units, selecting instructions and tables giving data on capacities.

Copies of any of the literature listed here may be obtained by writing directly to the companies involved, or by addressing THE FOUNDRY, in care of Readers' Service Department, 1213 West Third Street, Cleveland

PIG IRON—Wisconsin Steel Co., Chicago, has issued a 16-page booklet describing the production and use of its small pigs. Photographs illustrate castings made with the company's iron.

WELDING — Lincoln Electric Co., 12818 Coit road, Cleveland, has issued bulletin 401-A of 36 pages, giving procedures for producing all types of welds in various metals as well as describing and illustrating protective clothing for welders.

CLAMPS — M. B. Skinner Co., South Bend, Ind., has issued a 32-page catalog, No. 38 A, describing its various repair clamps and saddles for steel and cast iron pipe and reseater equipment. Pictures illustrate various articles and their applications. Specifications for the different types of equipment are included.

OVEN CONTROL—Bristol Co., Waterbury, Conn., has published a bulletin No. 521, describing pyrotrol, designed for use on gas-fired industrial heaters. The two models available are completely described with schematic drawings of practical applications.

BATTERIES — Electric Storage Battery Co., Allegheny avenue and Nineteenth street, Philadelphia, has published a 36-page book describing the many phases with which every day use is made of Exide batteries. Concisely written and well illustrated, it shows clearly the advancement made in batteries in the past 50 years.

MATERIALS HANDLING — Bulletin No. 83, a 48-page catalog, has been issued by the C. O. Bartlett & Snow Co., Cleveland. The first pages of the catalog describe station coal handling equipment, give operating views of standard and special designs of large capacity hoppers, feeders, belt conveyors, bunkers, galleries, and skip hoists. The balance of the book describes standardized equipment developed for boiler plants.

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